

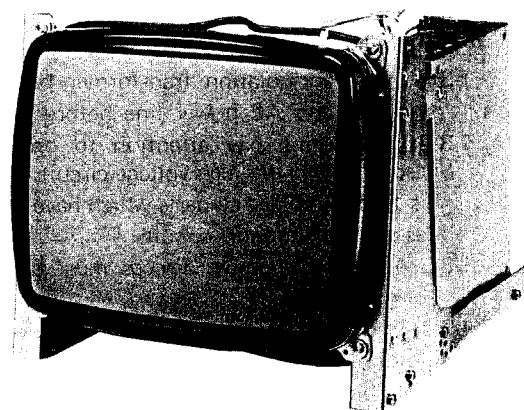
Service Manual

Color CRT Data Display

MODEL TX-1201FH

Chassis No. X04

Original



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1. SAFETY PRECAUTIONS

1-1 CAUTION:

No modification of any circuit should be attempted. Service work should only be performed after you are thoroughly familiar with all of the following safety checks and servicing guide lines.

1-2 SAFETY CHECK

Care should be taken while servicing this CRT display because of the high voltage used in the deflection circuits. These voltages are exposed in such areas as the associated flyback and yoke circuits.

1-3 FIRE & SHOCK HAZARD

1-3-1 Insert an isolation transformer between the CRT display and AC power line before servicing chassis.

1-3-2 In servicing pay attention to original lead dress especially in the high voltage circuit. If a short circuit is found, replace all parts which have been overheated as a result the short circuit.

1-3-3 All the protective devices must be reinstalled per original design.

1-3-4 Soldering must be inspected possible for cold solder joints, frayed leads, damaged insulation, solder splashes or sharp solder points. Be certain to remove all foreign material.

1-4 IMPLOSION PROTECTION

All Panasonic picture tubes are equipped with an integral implosion protection system, but care should be taken to avoid damage and scratching during installation. Use only Panasonic replacement picture tubes.

1-5 X-RADIATION

WARNING: The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level.

Note: It is important to use an accurate periodically calibrated high voltage meter.

1-5-1 To measure the high voltage, use a high impedance high voltage meter, Connect(−) to chassis and (+) to the CRT anode button.

1-5-2 Turn the Brightness control fully counterclockwise.

1-5-3 Measure the high Voltage. The high voltage meter should indicate at the following factory-recommended level.

1-5-4 If the upper meter indication exceeds the maximum level, immediate service is required to prevent the possibility of premature component failure.

1-5-5 To prevent X-Radiation possibility, it is essential to use the specified picture tube.

1-5-6 The nominal high voltage is 24.5KV and must not exceed 25KV at zero beam current at rated voltage.

IMPORTANT SAFETY NOTICE

There are special components used in Panasonic CRT displays which are important for safety. These parts are shaded on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacture's specified parts to prevent X-RADIATION, shock, fire or other hazards. Do not modify the original design without written permission of the Panasonic company or this will void the original parts and labor guarantee.

GENERAL INFORMATION

Here is an outline of Model TX-1201FH.

This model is COLOR CRT DATA DISPLAY of metal frame type.

TX-1201FH uses High Resolution (Dot pitch 0.31mm) color Cathode Ray Tube.

Input signal is separate type and each input signal is put through 20 pin Connector on the P.C. Board.

Input signal is for TTL level and H. drive pulse is capable of corresponding to 23.81μS.

In order to meet users' requirements, frame mechanism is employed for easy adjustment of CRT setting angle.

Angle can be changed by stages such as 0°, 2.5°, 7.5° and 10°. Switching regulator Circuit is Applied to for power supply of this model, and it is available for AC input 90~140V / 180~264V by changing the select switch (115V / 220V) which built-in the Switching Regulator.

COLOR DISPLAY SPECIFICATIONS

1. MECHANICAL DESCRIPTION

Dimension:

Height:	10.39" (264mm)max.
Width:	12.40" (315mm)max.
Depth:	14.63" (371.6mm)max.
Weight:	25.4 lbs (11.5kg)
Picture Tube:	320DAB22TC01
	Size 12"
	Gun In-Line
	Def, Angle 76°
	Neck dia 1.146" (29.1mm)
	Phosphor R. G. B
Tilt:	10°

2. ENVIRONMENT

Ambient temp, Humidity and Altitude:

Operating:

Temp:	32°F~122°F (0°~50°C)
Humidity:	5~90%
Altitude:	10,000 FT max. (3,000m)

Non-operating:

Temp:	-40°F~149°F (-40~65°C)
Humidity:	5~90%
Altitude:	40,000 FT max. (12,000m)

Storage and Shipment:

Temp:	-40°F~149°F (-40~65°C)
Humidity:	5~90%
Altitude:	40,000 FT max. (12,000m)

Vibration and Shock: (Packaged condition)

Vibration:

meet the following:

Frequency:	5~55 Hz
Vertical:	1.25 G
Horizontal:	0.75 G

Shock:

Coner and edge:	Height 19.69" (50cm)
Front, Back, Side, Bottom:	Height 23.62" (60cm)

3. ELECTRIC PERFORMANCE

Power supply:

Input Voltage:	AC90~140 / 180~264V
Input Frequency:	50 / 60Hz
Input Current:	0.8A max.
Power:	55W max.
Inrush Current:	45 A op max. (at 100V AC)

Input Signals:

Horizontal Sync:

Polarity:	Negative
Signal Level:	4Vpp ± 1V
Input Imp.	≧ 1.5K

Vertical Sync:

Porarity:	Negative
Signal Level:	4Vpp ± 1V
Input Imp.	≧ 1.5V

Video Signal (R.G.B)

Polarity:	Positive
Signal Level:	4Vpp (See Note 1)
Tr. Tf:	≧ 5NS

Note 1. Max rise and fall times (from 10% to 90%) of input signals are less than 5 NS.

Image test Condition:

Charactor:	"H"
Color:	Green
Brightness:	Max.(without Back Raster)
View Direction:	Parallel to the CRT axis
Ambient Temperature:	Room Temp
Supply Voltage:	AC 115V

Note 2. To measure more then 20 minutes after power on.

Note 3. Normal Condition is the Condition that Satisfies Image test Condition. (Condition of following each items is normal condition, it not mentioned).

Video Out:

Turn Rise Time (Tr):	Less then 20nS
Turn Fall Time (Tf):	Less then 30nS
(To measure by 10MHz square-wave Duty 50%).	

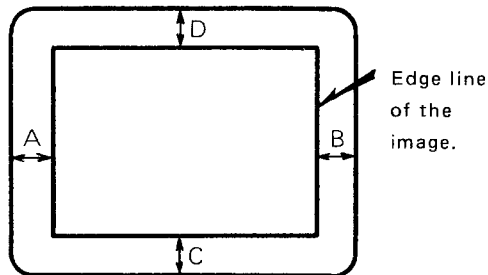
Image:

Charactet Area:

Horizontal:	8.27 ± 0.2" (210 ± 5mm)
Vertical:	5.75 ± 0.2" (146 ± 5mm)

IMAGE POSITION:

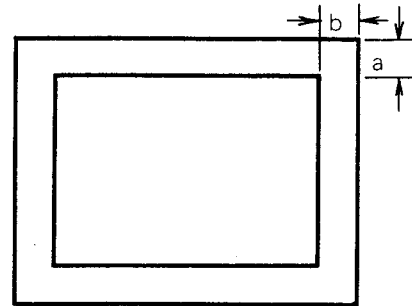
To be able to adjust at the center of the CRT.
Image is within the area in Fig.



$A-B \leq 0.197''$ (5mm)
 $C-D \leq 0.197''$ (5mm)
Normal Condition

(B) RECTANGULARENESS & PARALLELOGRAM DISTORTION

Edge of the image is within the area indicated by the dotted line in Fig.

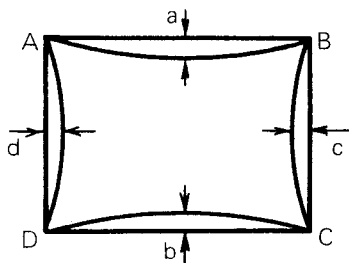


$a \dots\dots 0.138''$ (3.5mm)
 $b \dots\dots 0.138''$ (3.5mm)
Input signal.....Cross-hatch

DISTORTION:

(A) PINCUSHION

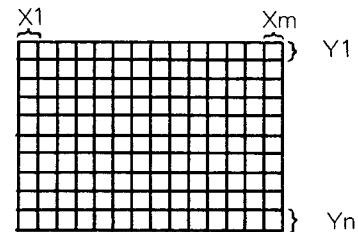
Upper: (a): Less than 0.087'' (2.2mm)
Lower: (b): Less than 0.098'' (2.5mm)
Right and Left (c), (d):
Less than 0.079'' (2.0mm)



Input signal.....Cross-hatch

(C) LINEARITY

Horizontal and vertical linearity shall be less than 7% see Fig.



Horizontal linearity

$$\frac{X_{\max} - X_{\min}}{X_{\max} + X_{\min}} \times 100(\%) \leq 7\%$$

Vertical linearity

$$\frac{Y_{\max} - Y_{\min}}{Y_{\max} + Y_{\min}} \times 100(\%) \leq 7\%$$

Note: Maximum and minimum value should not be adjacent to each other.

X_{\max} is maximum value among $X1 \sim Xm$.

X_{\min} is minimum value among $X1 \sim Xm$.

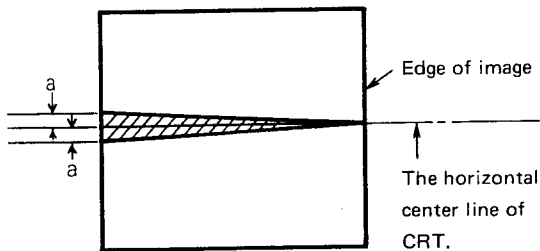
Y_{\max} is maximum value among $Y1 \sim Yn$.

Y_{\min} is minimum value among $Y1 \sim Yn$.

Input signal.....Cross hat, Green.

(D) ROTATION

Horizontal center line of the image shall be within the shaded area in Fig.



$a \dots\dots 0.087''$ (2.2mm)

Input signal.....Cross-hatch, Green.

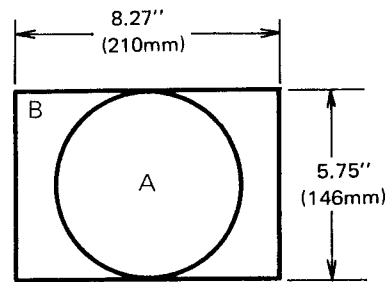
Note: Should be measured under the following terrestrial magnetic field.

- 1). Without horizontal magnetic field.
- 2). With vertical magnetic field.

IMAGE SIZE VARIATION:

	Image size variation from the normal image size.	Range of Variation
By Brightness	Within 0.118'' (3mm) (Horizontal and Vertical)	Max. to Min.
By Power Supply Voltage	Within $\pm 0.157''$ (± 4 mm) (Horizontal and Vertical)	AC 90~140V AC 180~264V
By temperature	Within $\pm 0.157''$ (4mm) (Horizontal and Vertical)	$25 \pm 25^\circ$ C

Normal condition, if not mentioned.

**OVERALL PERFORMANCE:
MIS-CONVERGENCE**

Center of the display area

(A) $\leq 0.0197''$ (0.5mm)

Peripheral display area

(B) $\leq 0.0276''$ (0.7mm)

Note: Should be measured under the following conditions.

- *With out horizontal magnetic field.(terrestrial).
- *with vertical magnetic field.
- *At room temperature.
- *Input signal : Cross-hatch, R.G.B. mixed color.

HORIZONTAL RESOLUTION:

Horizontal 720pixels
Vertical 580pixels

RESISTER BETWEEN FG AND SG:

15Kohms $\pm 10\%$

INSULATION:

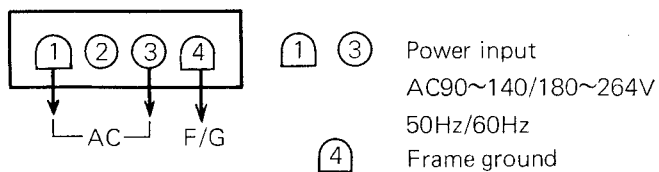
More than 100Mohms
(Between AC line and Chassis)

JITTER:

Less than 1 dot.
(Invisible at a distance of 17.7'' (45cm) from CRT surface.)

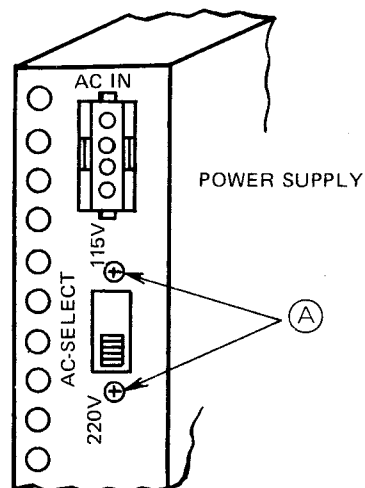
CONNECTOR AND WIRING

POWER SUPPLY:



When factory shipping, the power select Switch of the monitor power supply is set at 220V Side (AC input 180~264V).

There fore when use this unit in the 90~140V area, loose the 2(two) screws (A) as shown figre before 'power on then change the switch at 115V Side.

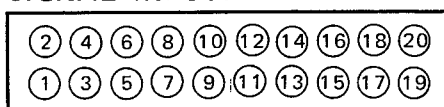


CONNECTOR TYPE:

MFR.....AMP Lock Connector

Display Side	Customer Side
4-Cap-housing (350780-1)	Connector (350779-1)
Pin Contact (350561-1)	Contact (350570-1)

SIGNAL INPUT:



Pin No.	Name	Pin No.	Name
1	Vertical Sync(V,S)	2	V.RTN (SG)
3		4	
5	Horizontal Sync(H,S)	6	H.RTN (SG)
7	Sound (Option)	8	SG
9		10	SG
11		12	SG
13		14	SG
15	Video (R)	16	R.RTN (SG)
17	Video (G)	18	G.RTN (SG)
19	Video (B)	20	B.RTN (SG)

CONNECTOR TYPE:

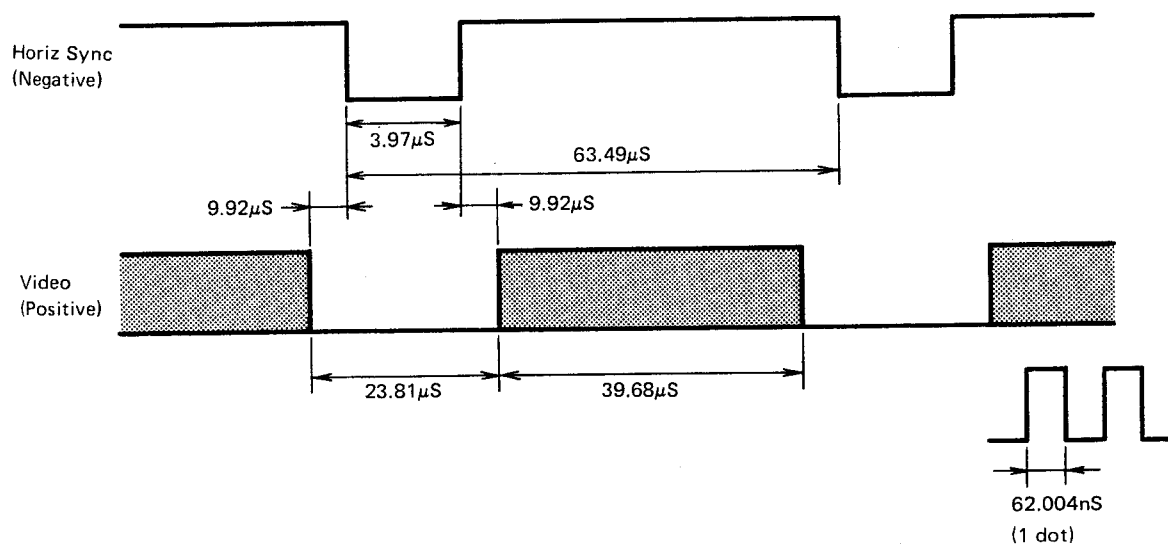
Display Side
MFR...Hirose Electric Co.,Ltd.
20P Connector
(HIF3-20P-254DS)

Custmer Side
MFR...Hirose Electric Co.,Ltd.
20P Connector
(HIF3N-20P-254R)

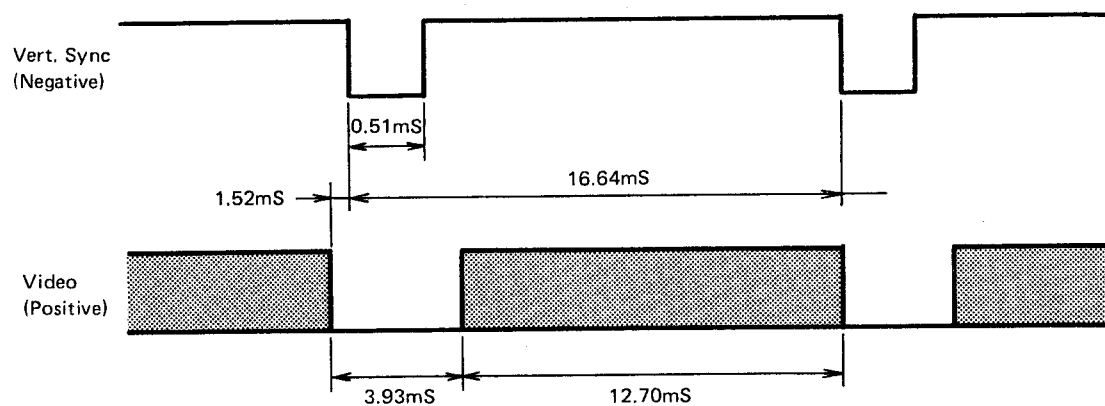
Note: The connectors of customer side are for your reference.

TIMING CHART

HORIZONTAL SYNC:



VERTICAL SYNC:



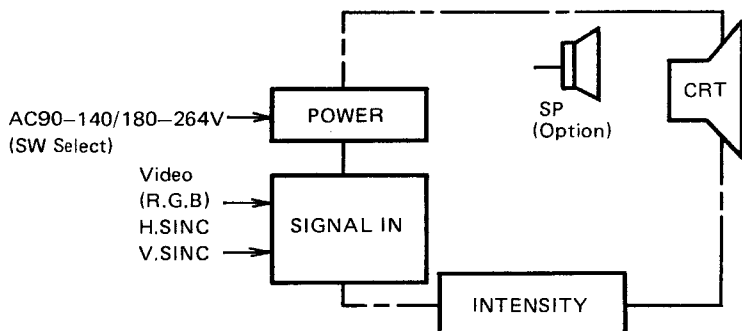
Note: Signal input level: TTL level

Time Tolerance: $\pm 0.1\%$

Unit is adjusted according to this timing and frequency.

CONSTRUCTION AND BLOCK DIAGRAM

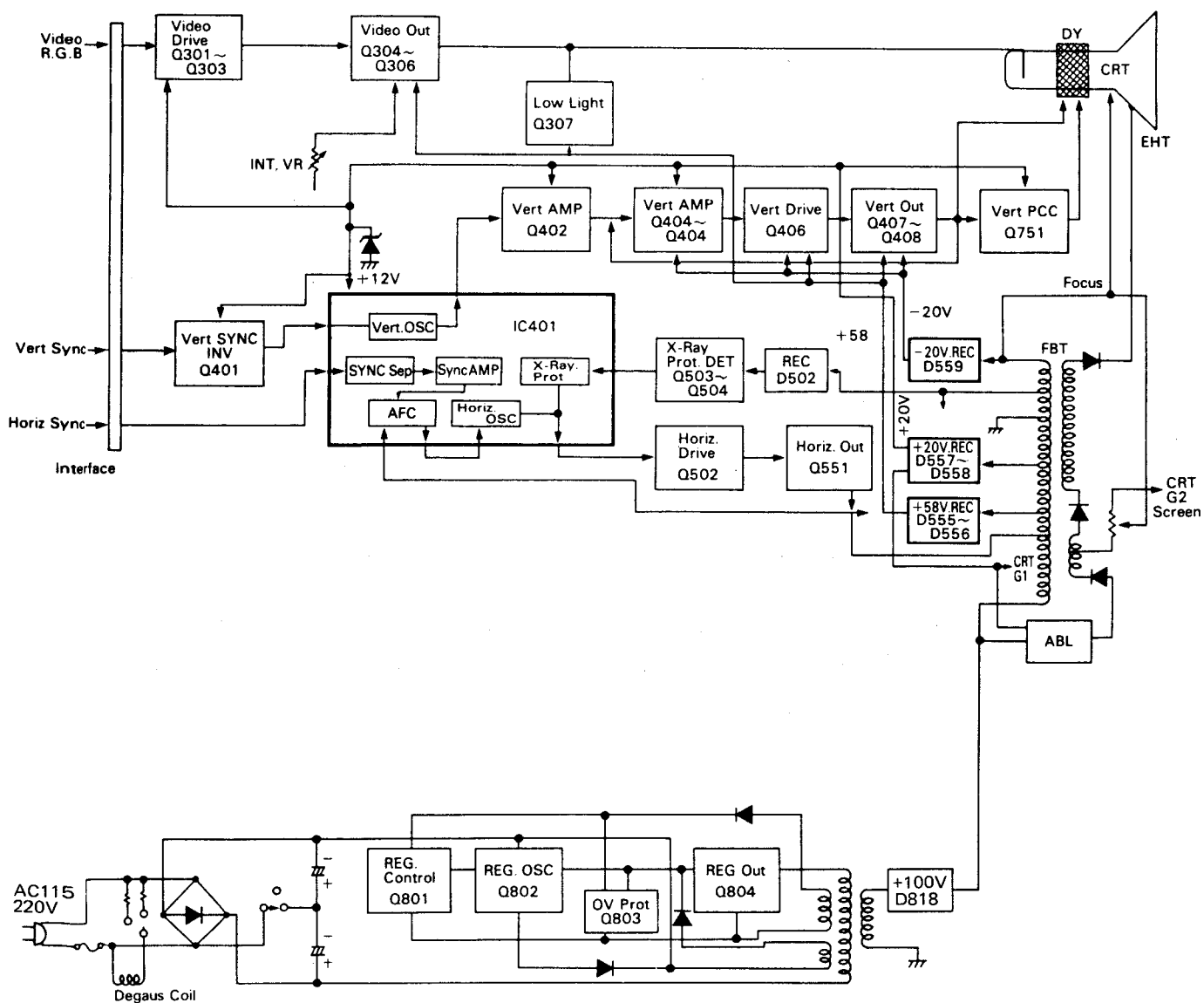
CONSTRUCTION OUTLINE



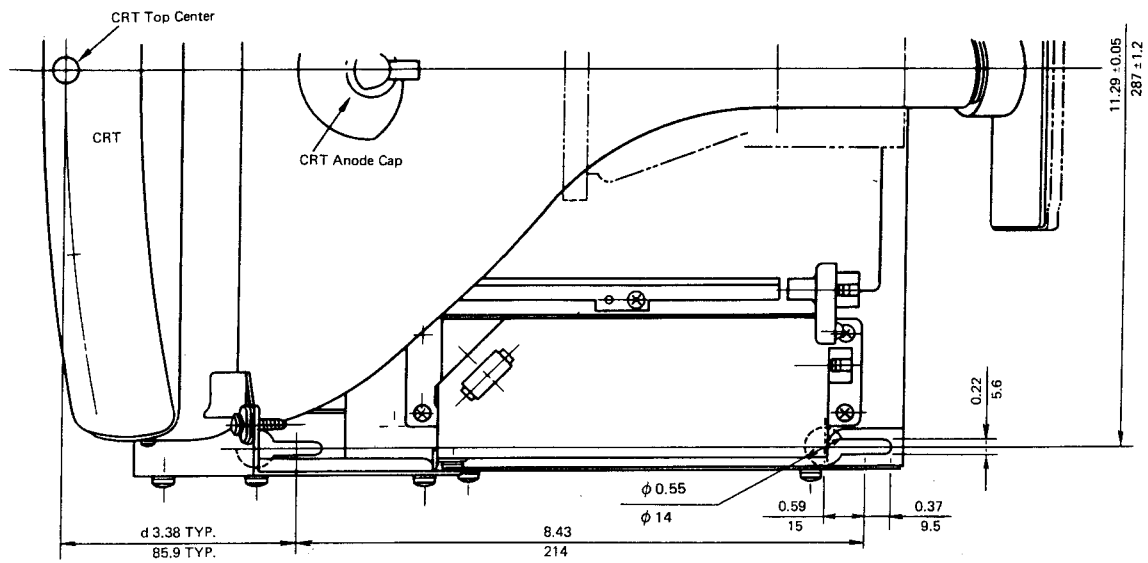
Note 1: CRT's Conducting Film is Connected to SG. (Signal Ground)

Note 2: SG and FG (Frame Ground) are separated by 15Kohm resistor.

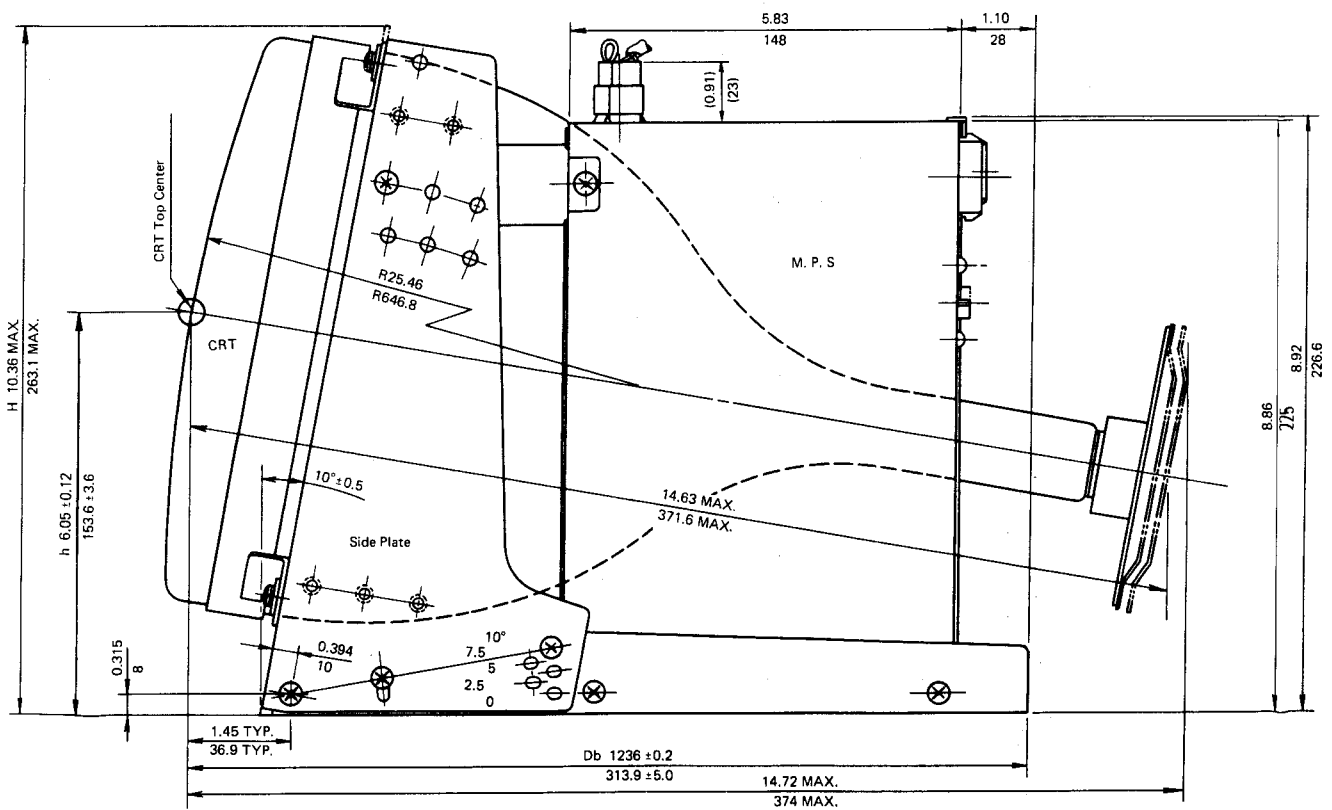
BLOCK DIAGRAM



DIMENSION

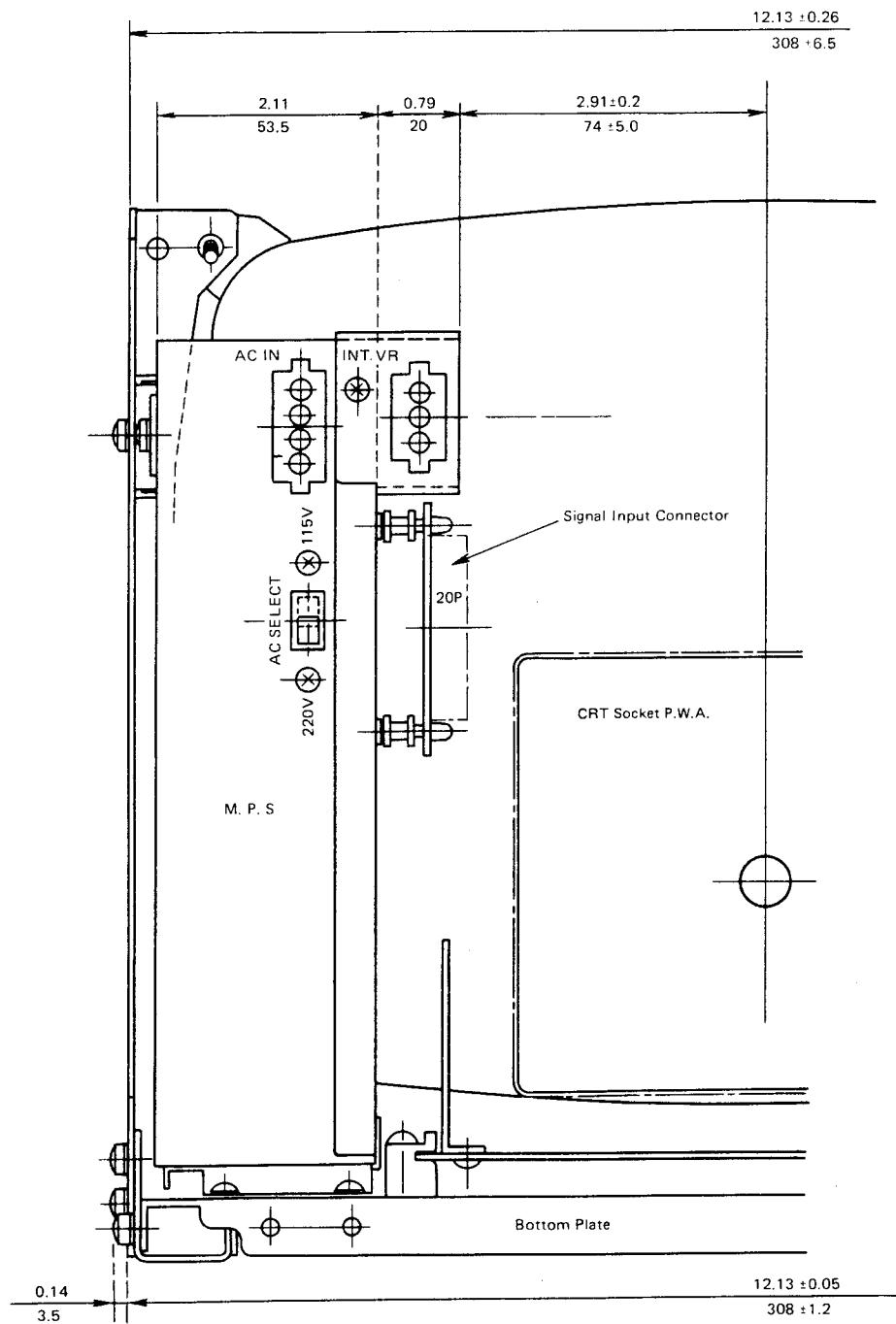


Dimension:
Upper Side: inch
Bottom Side: mm

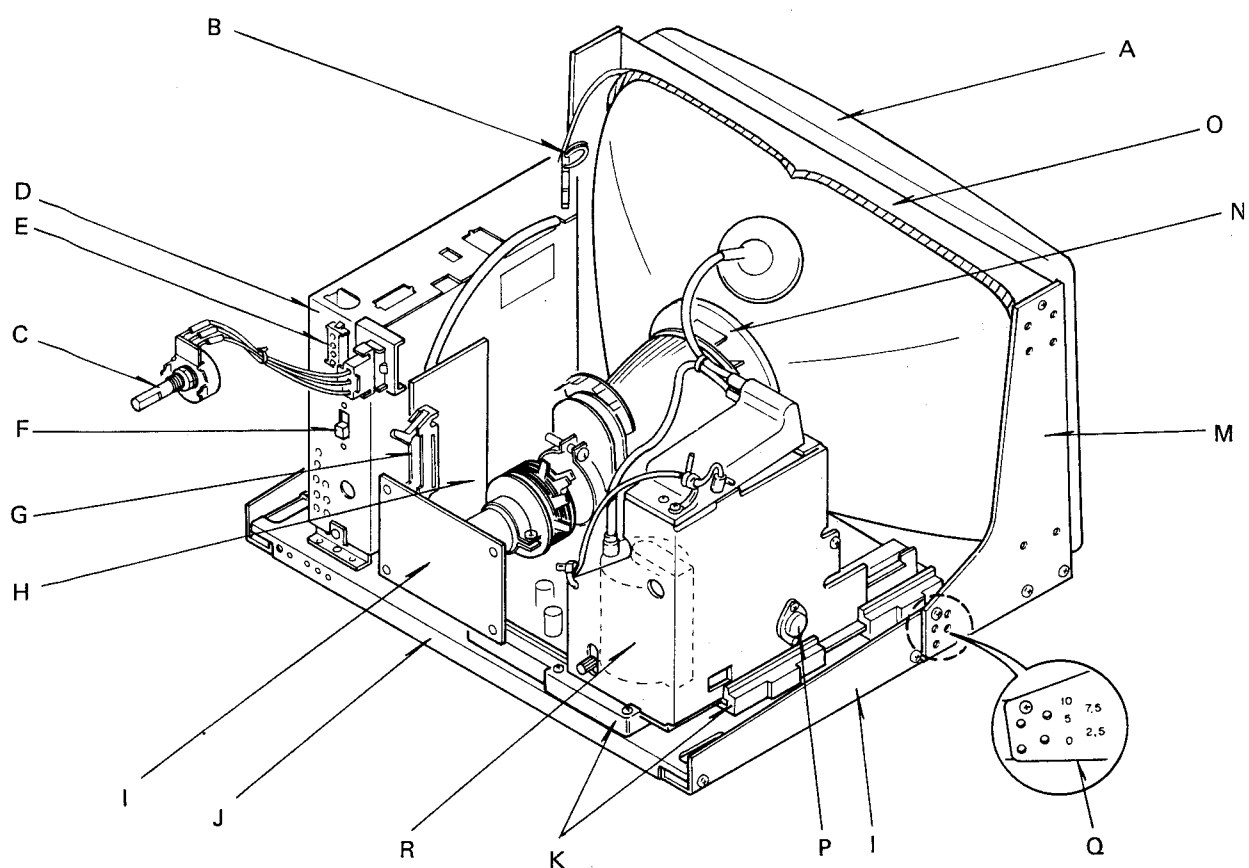


CRT TILT	H MAX.		± 0.12 h ± 30		d TYP.		± 0.2 Db ± 5.0	
	(inch)	(mm)						
0°	10.39	264.0	5.71	145.0	4.35	110.6	13.33	33.66
2.5°	10.41	264.3	5.81	147.6	4.12	104.6	13.03	332.6
5°	10.39	264.0	5.91	150.0	3.87	98.4	12.85	326.4
7.5°	10.37	263.3	5.98	151.9	3.63	92.2	12.61	320.2
10°	10.36	263.1	6.05	153.6	3.36	85.9	12.36	313.9

Dimension:
Upper Side: inch
Bottom Side: mm



COMPONENT LOCATION



ACRT

BDegaus Coil Cnector

CIntensity VR

DPower Supply

EPower input Connector

FPower Select Switch

GSignal Input Connector

HInterface Board

ICRT Socket Board

JBottom Plate

KP.W.A Holder

LMounting Metal

MSide Plate

(Right and Left)

NDeflection Yoke

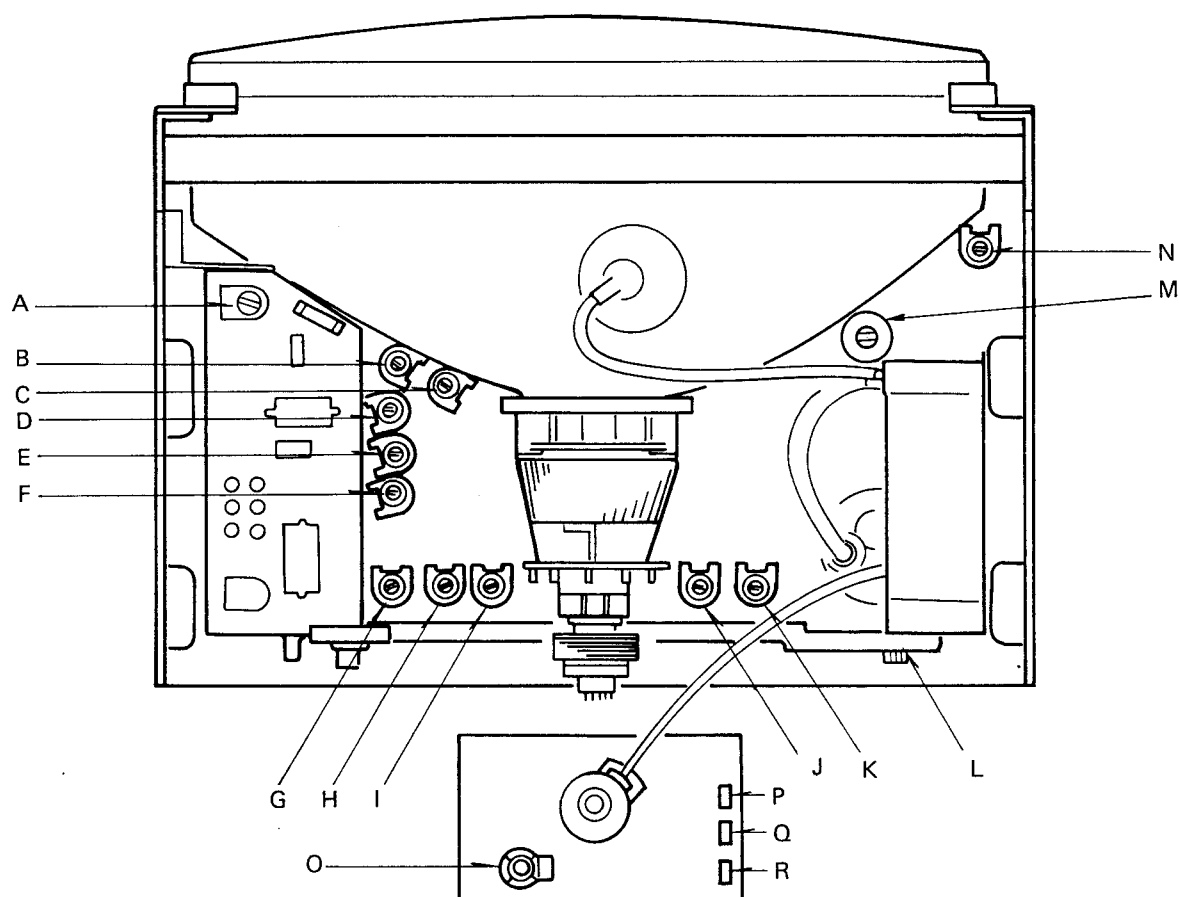
ODegauss Coil

PH. OUT. TR (Q551)

QCRT Tilt Chang Posi

RFBT

CONTROL DESCRIPTION



A.....B-ADJ (VR81)
 B.....V.PCC (R754)
 C.....V.Lin (R424)
 D.....R.GAIN (R301)
 E.....G.GAIN (R311)
 F.....B.GAIN (R321)
 G.....V.POSI (R420)

H.....V.SIZE (R426)
 I.....V.HOLD (R407)
 J.....H.HOLD (R516)
 K.....H.PHASE(R540)
 L..... FOCUS
 M..... H.WIDTH (L553)
 N.....SUB BRIGHT (R554)

O.....SCREEN (R372)
 P.....LOWLIGHT R
 (R338)
 Q..... LOWLIGHT B
 (R358)
 R.....LOWLIGHT G
 (R348)

CAUTION TO ADJUSTMENT AND REPAIR

1. Degaussing is inevitably required at purity adjustment or convergence adjustment.
2. At the factory, white balance meter is used but we described the data in simple way.
3. If you check or adjust electrical specification or function, more than 20 minutes burn-in is required.
4. Reforming of the leadwire is required after your repair work.

CAUTION FOR SERVICING

In case of servicing or replacing CRT, high Voltage sometimes remains in the anode of CRT, So, completely discharge high voltage before servicing or replacing CRT so as to prevent a shock to the serviceman.

In this case, discharge to the external conductive coating (aquadac) of CRT.

Factory set the switch at 220V side of monitor power supply.

When you need switchover, off is required before it. As this model is the Frame type, any pressure on the CRT neck shall be avoided.

ADJUSTMENT PROCEDURE

1. Voltage adjustment

(1) +B (100V) Voltage adjustment

Adjust the VR81 (+B-ADJ) so as that the voltage at TP1 (test point of TNP82832) shall be 100V.

(2) Confirming the +B2, -B3, +B4.

2-1 +B2 (+58V)

Confirm the voltage at TP3 (test point of A-P, W, B) is $+58 \pm 2V$.

2-2 -B3 (-20V)

Confirm the voltage at TP4 (test point of A-P, W, B) is $-20 \pm 2V$.

2-3 +B4 (+20V)

Confirm the voltage at TP5 (test point of A-P, W, B) is $+20V \pm 2V$.

(3) Confirm the Heater voltage

Measure and confirm the voltage at the seventh pin of CRT socket is $6.0 \pm 0.2V_{rms}$.

Measuring should be done later more than five minutes after power on.

2. CRT Screen adjustment (Adjustment of CRT cut off)

- 1) Adjust the R,G,B switch of signal generator so as that the CRT screen shows no signal.
- 2) Turn the sub-brightness VR (R554) to the MIN.
- 3) Turn the screen VR (R372) to the MIN.
- 4) Turn all the low light VRs clockwise from the solder view.
- 5) Insert the service switch of SC401 into "S" side.
- 6) Turn R554 (sub-brightness VR) so as that the voltage of G1 is $-37V$.
Use the probe of 100:1 ratio.
- 7) Turn the screen VR and find what is the color which is light emitted at the last moment.
- 8) Turn the low light VRs of each color except that of your finding at item 7 toward darkness to the MAX.
- 9) Turn the screen VR and set it where the color you found at item 7 can be seen slightly.
- 10) Turn the low light VRs of other two colors and set them where these two colors can be seen at the same degree as you adjusted the color at item 9.
- 11) Insert the service switch of SC401 into "N" side.
- 12) Adjust R554 (Sub-brightness control volume on

Main P.W.A) and set at the point where raster is off.

- 13) Viewing the oscilloscope, turn the R554 anti-clockwise until the voltage lowers 5V further (CRT 8 pin G1 voltage shows $-22V$.)

3. White Balance adjustment

- 1) Set the video gain volume (R.G.B) at the center.
- 2) Input the white signal of "H".
- 3) Adjust the video gain volumes (R:R308, G:R318 B:R328) so as that CRT shows white color.
- 4) After adjusting the white balance, rotate the brightness volume from MAX to MIN and make sure that the white balance is not changed.
If something is wrong, please adjust the low light volume.

4. Purity adjustment

In case of ITC, this specification is applied only when the problem is found in the execution of "final confirmation method for purity"

- 1) Make sure that this adjustment should be done later more than 30 minutes after power on.
- 2) In the no magnetic field, erase the magnetism of chassis and CRT with degaussing coil.
- 3) Confirm that static convergence is roughly matched.
- 4) Display Red color solely with the signal generator.
- 5) Move the D.Y. to rear and adjust the purity magnet so as that the fireball is showed at the center of the screen.
- 6) After the adjustment of item 5, re-adjust the static convergence if some gap was found.
- 7) After the item 6, repeat the item 5 again.
- 8) Display the fireball of G and B. Adjust the purity magnets so as that each fire ball is at the center of the screen simultaneously.
- 9) Display the red color solely again and move the D.Y. in order to display the red color on the whole screen.
- 10) Confirm the "no magnetic field", "magnetic field" and "reverse magnetic field" to R.G.B respectively.
- 11) If there remains magnetism even after the adjustment, put the compensation magnet for purity to make countermeasure.

The final confirmation method for purity

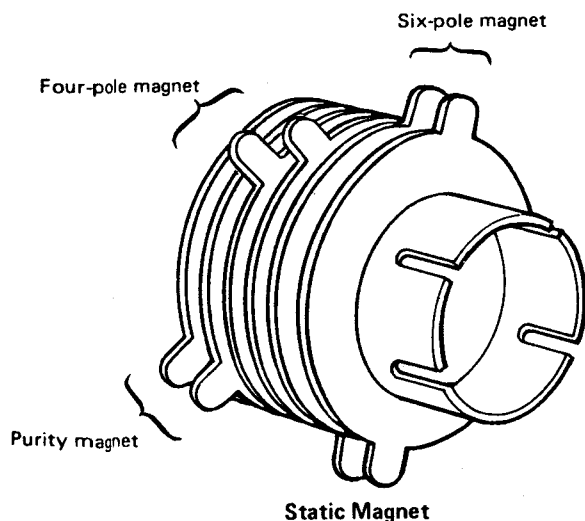
In the natural magnetic field, rotate the set in the direction of East, West, South and North. Field magnetic may causes magnetism on the set. Confirm that the automatic degaussing circuit built in the set can erase the amount of magnetism which was magnetized with above rotation.

5. Convergence adjustment

- 1) Input the mixed dot pattern of R and B with the signal generator.
- 2) Match the R and B at screen center with four pole magnet. (Rotate the two ring magnets and R, B move circularly with the other direction respectively.)
- 3) Input the mixed dot pattern of R.G.B with the signal generator.
- 4) At the screen center, match R and B to G with the six-pole magnet.
- 5) Make the fine tuning of D.Y. location so as to get good convergence on the whole screen.
- 6) If the convergence on the fringe area is bad, put "the magnetic small pieces" at the four corners of D.Y. and fix them the convergence becomes better.

Note: Caution for putting "the magnetic small pieces".

- (1) Take more than 20mm distance from anode cap.
 - (2) Don't put them dublicately.
 - (3) Don't put it on some other labels.
- 7) After the convergence adjustment, confirm if purity is OK.
In case purity is no good, back to [4] purity adjustment and re-adjust the purity.
- 8) Repeat the above procedure in several times and get the best purity and convergence.



6. H. Hold Adjustment

Adjust R516 (H. Hold), so as that the character area locates at the raster center (Horizontally).

7. V. Hold Adjustment

Turn the R407 (V. Hold) toward lower vertical frequency so as that the picture becomes out of synchronous.

Turn the R407 (V. Hold) toward the opposite direction to the before until the picture becomes synchronized.

8. V. LIN Adjustment

- 1) Display cross-hatch with the character generator.
- 2) Adjust R426 (V. Size) for the vertical size to be $5.75 \pm 0.079''$ ($146 \pm 2\text{mm}$).
Adjust R420 (V. Posi) for cross-hatch to locate at CRT center.
- 3) Adjust R424 (V. Lin) for the V. LIN to be the best.

9. V. size Adjustment

Adjust R426 (V. size) for the vertical size to be $5.75 \pm 0.079''$ ($146 \pm 2\text{mm}$).

10. V. POSI Adjustment

Adjust R420 (V. posi) for the character area to locate at the CRT center.

11. H. Width Adjustment

Adjust L553 (H. Width) for H. WIDTH to become $8.27 \pm 0.079''$ ($210 \pm 2\text{mm}$).

Note: Inserting the L553's core into bobbin is the direction of the adjustment.

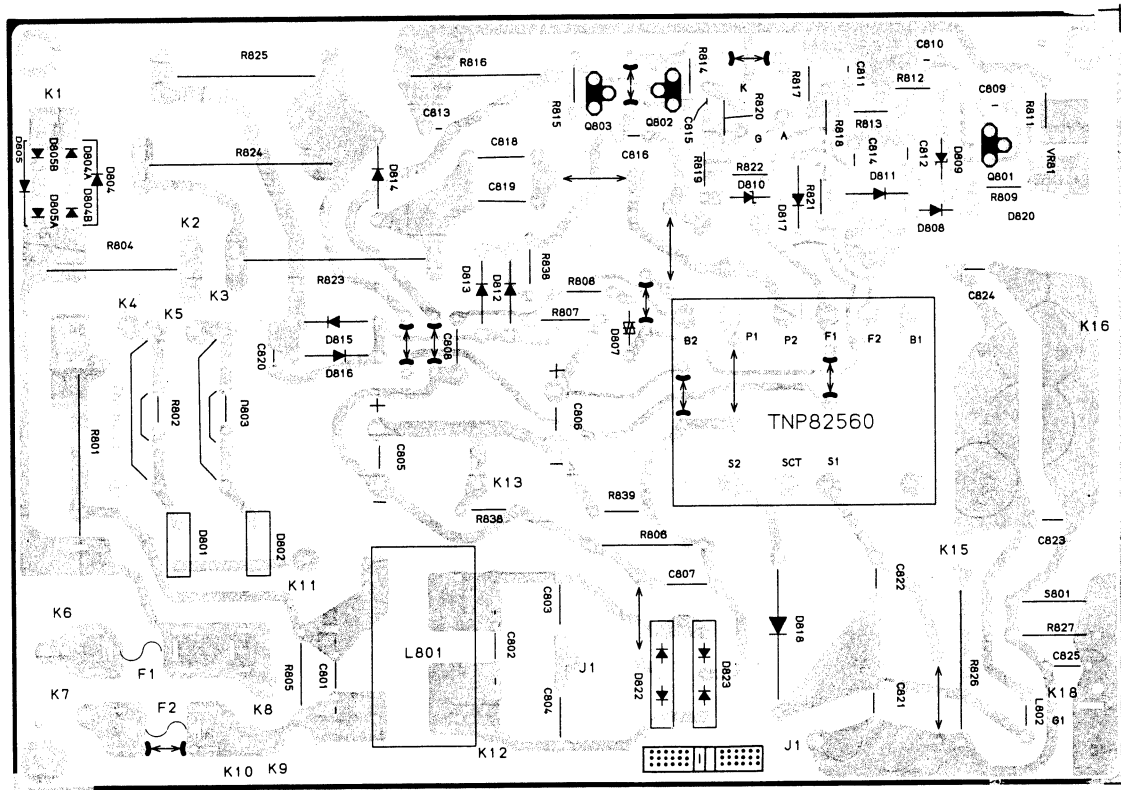
12. V. PCC (Vertical pin cushion) Adjustment

- 1) Display cross-hatch (Green color) with the signal generator.
- 2) Adjust R754 (V. PCC) for vertical pin cushion to become minimum.

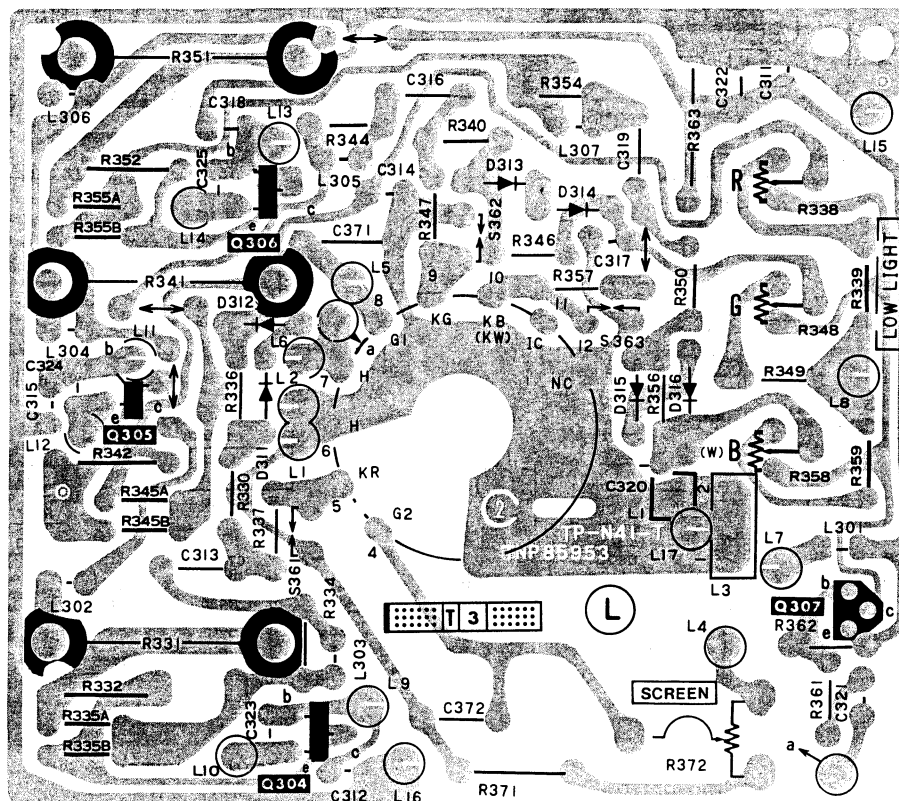
MEMO

POWER SUPPLY AND CRT-SOCKET CIRCUIT SOLDER VIEWS

MONITOR POWER SUPPLY CIRCUIT BOARD-SOLDER VIEW

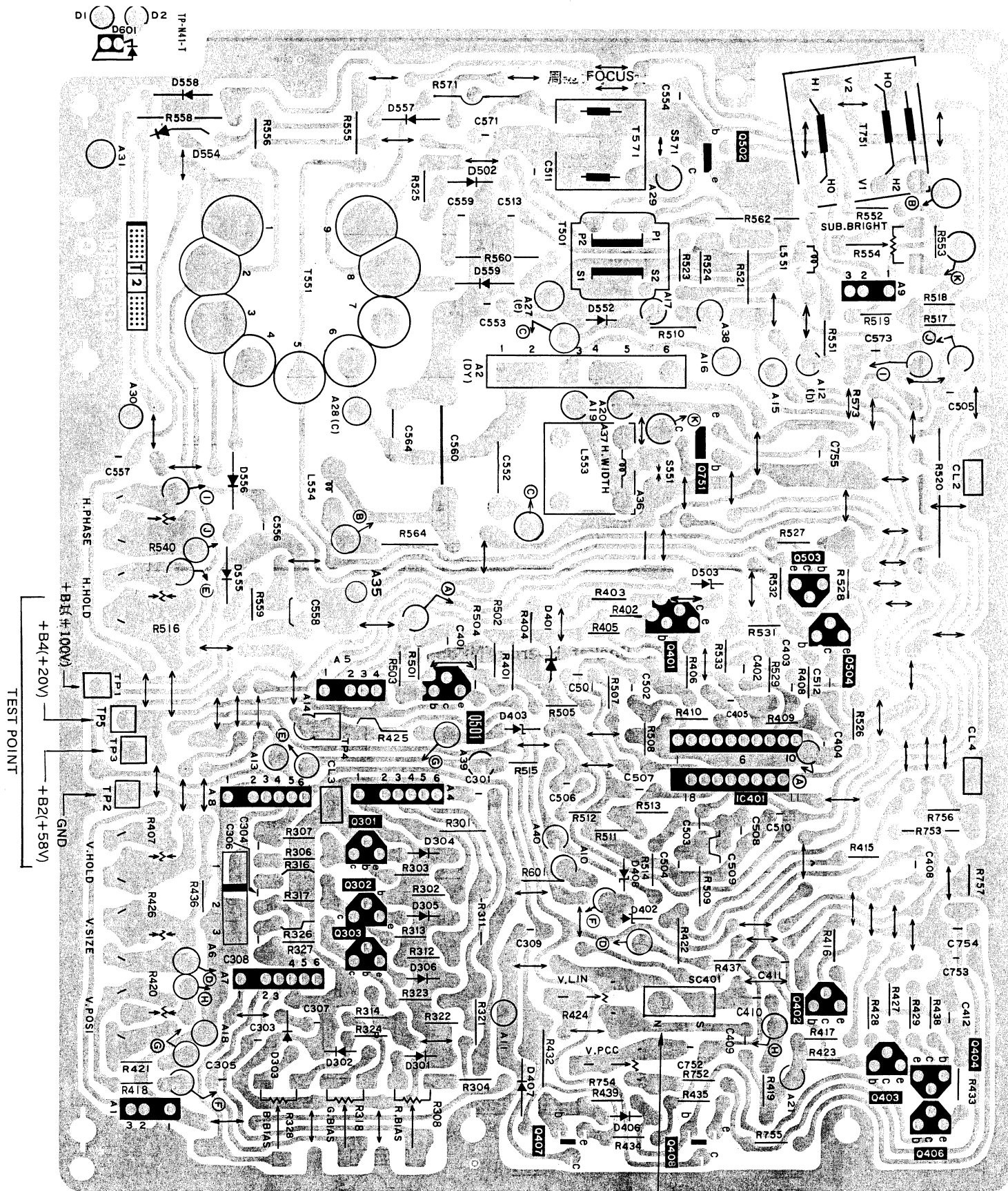


CRT Socket Board (TNP85953)



DRIVE CIRCUIT BOARD SOLDER VIEW

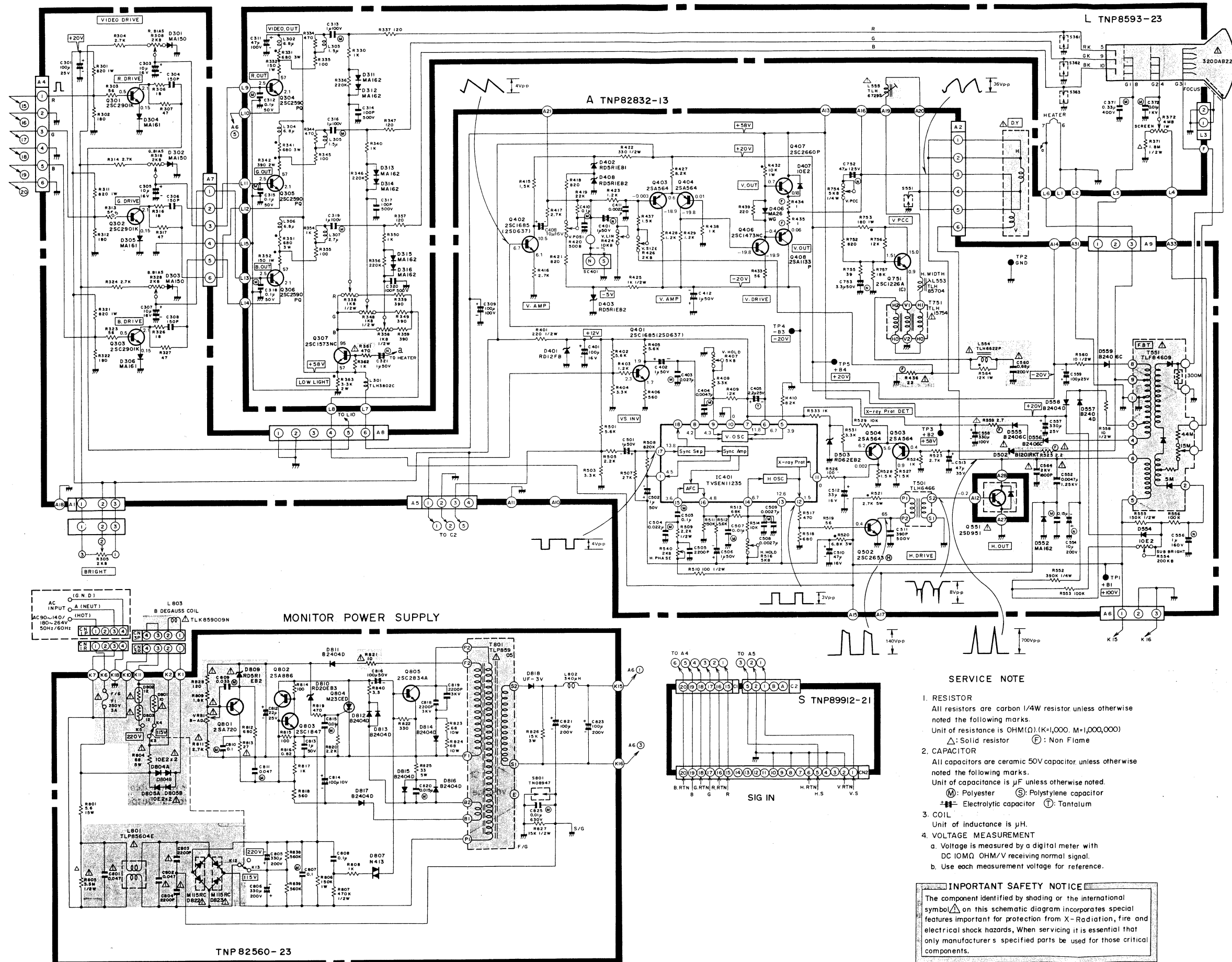
Analog Board (TNP82832)



TX-1201FH

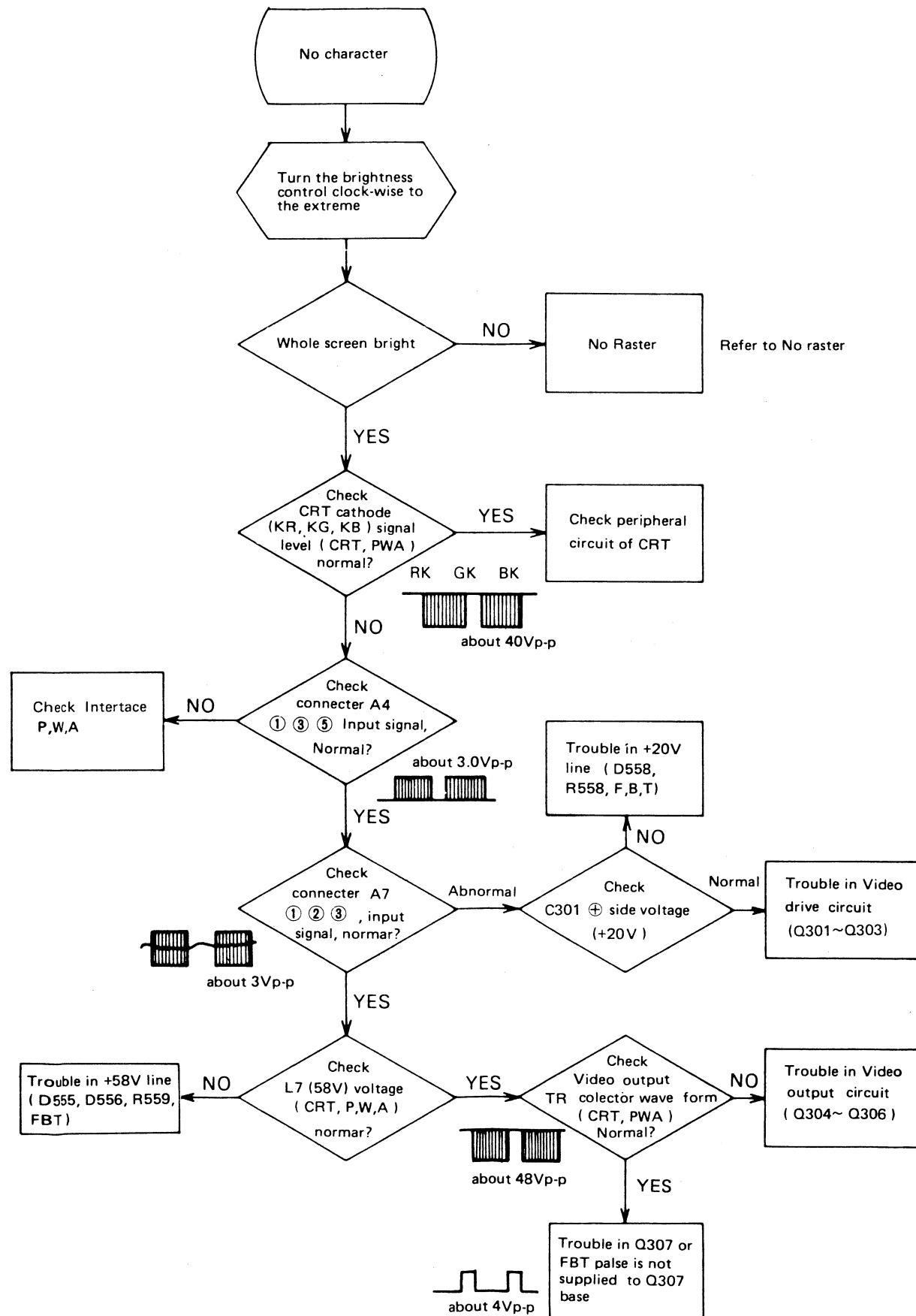
TX-1201FH

SCHEMATIC DIAGRAM FOR TX-1201FH

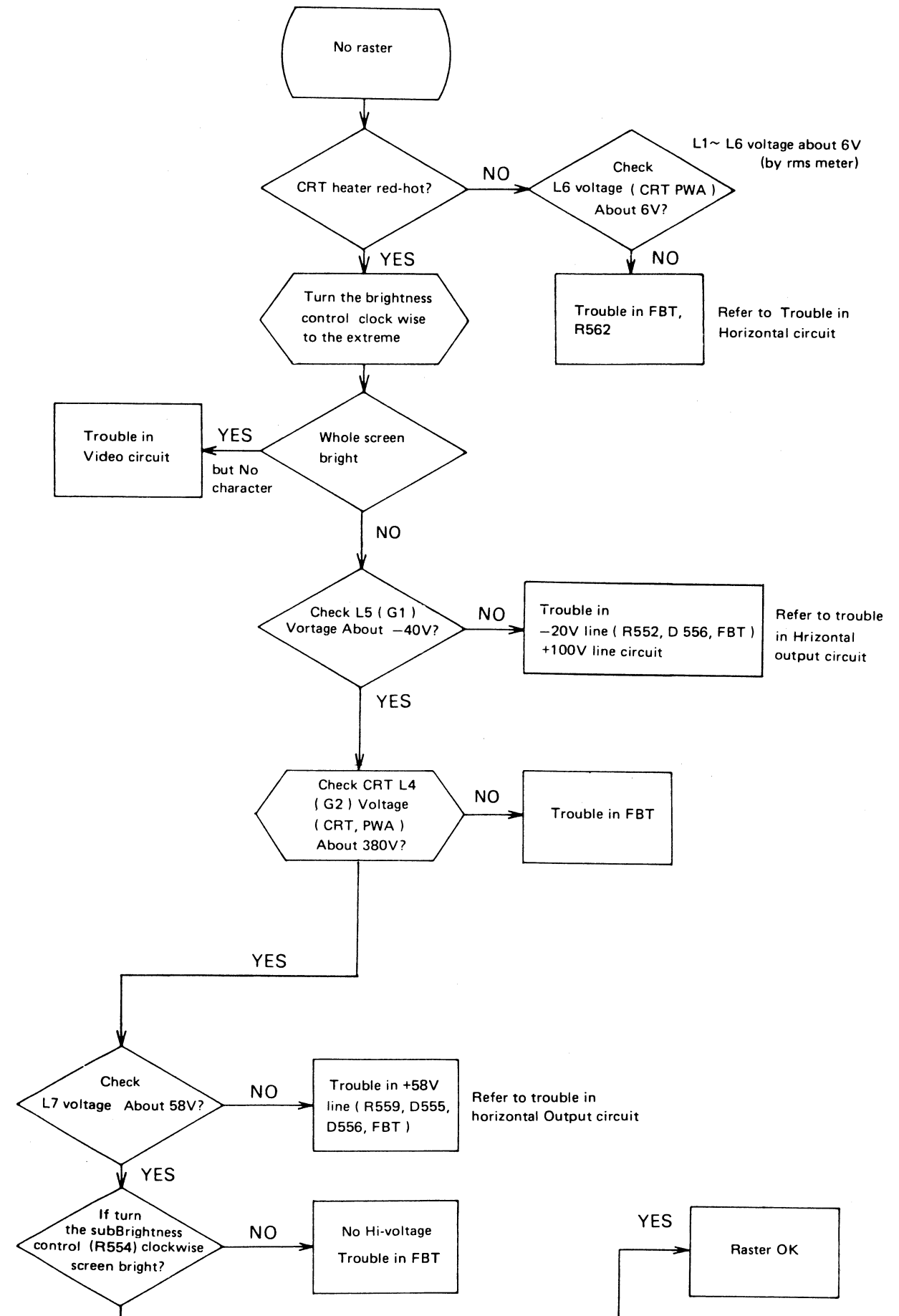


TROUBLE SHOOTING HINTS

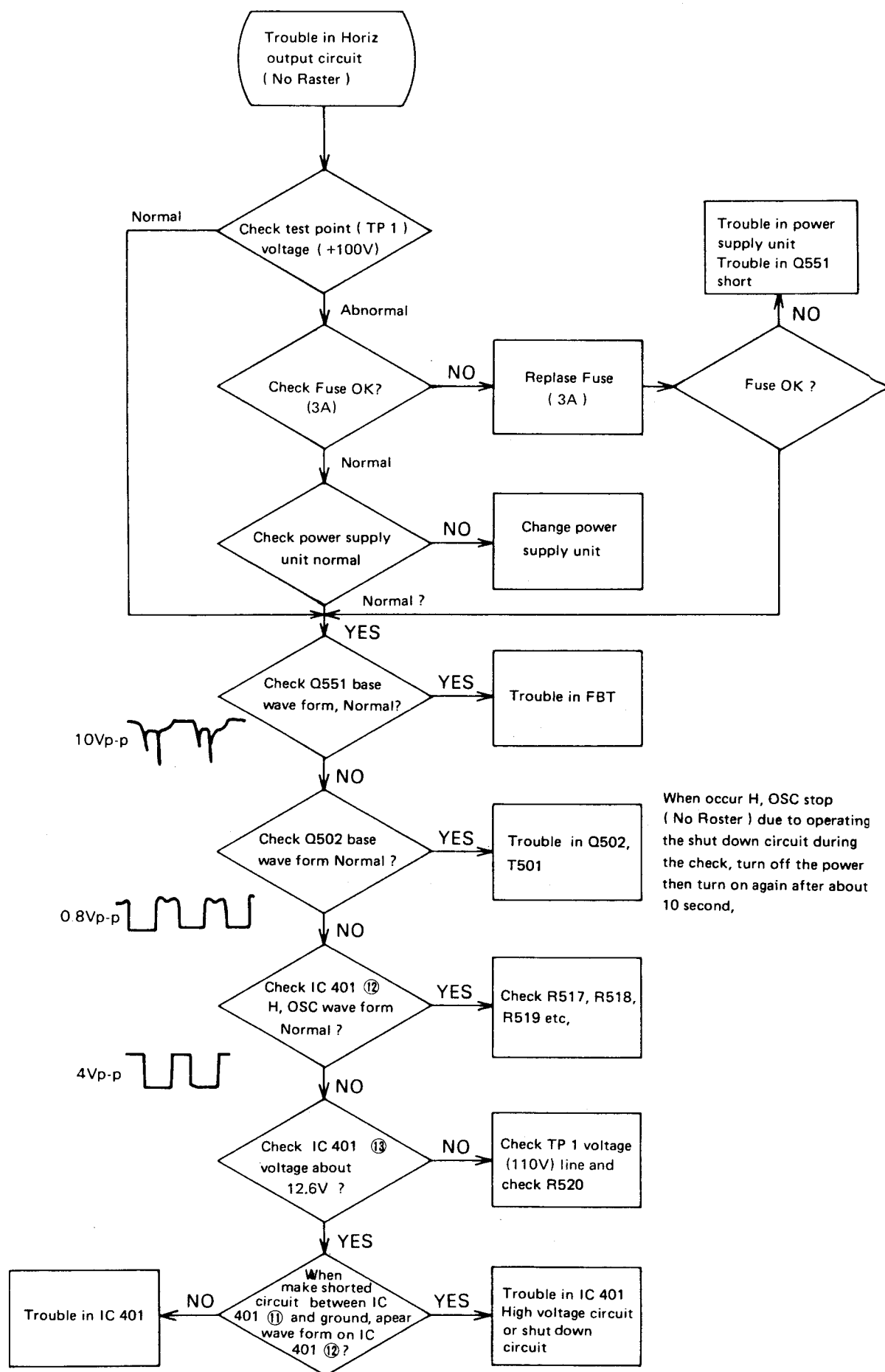
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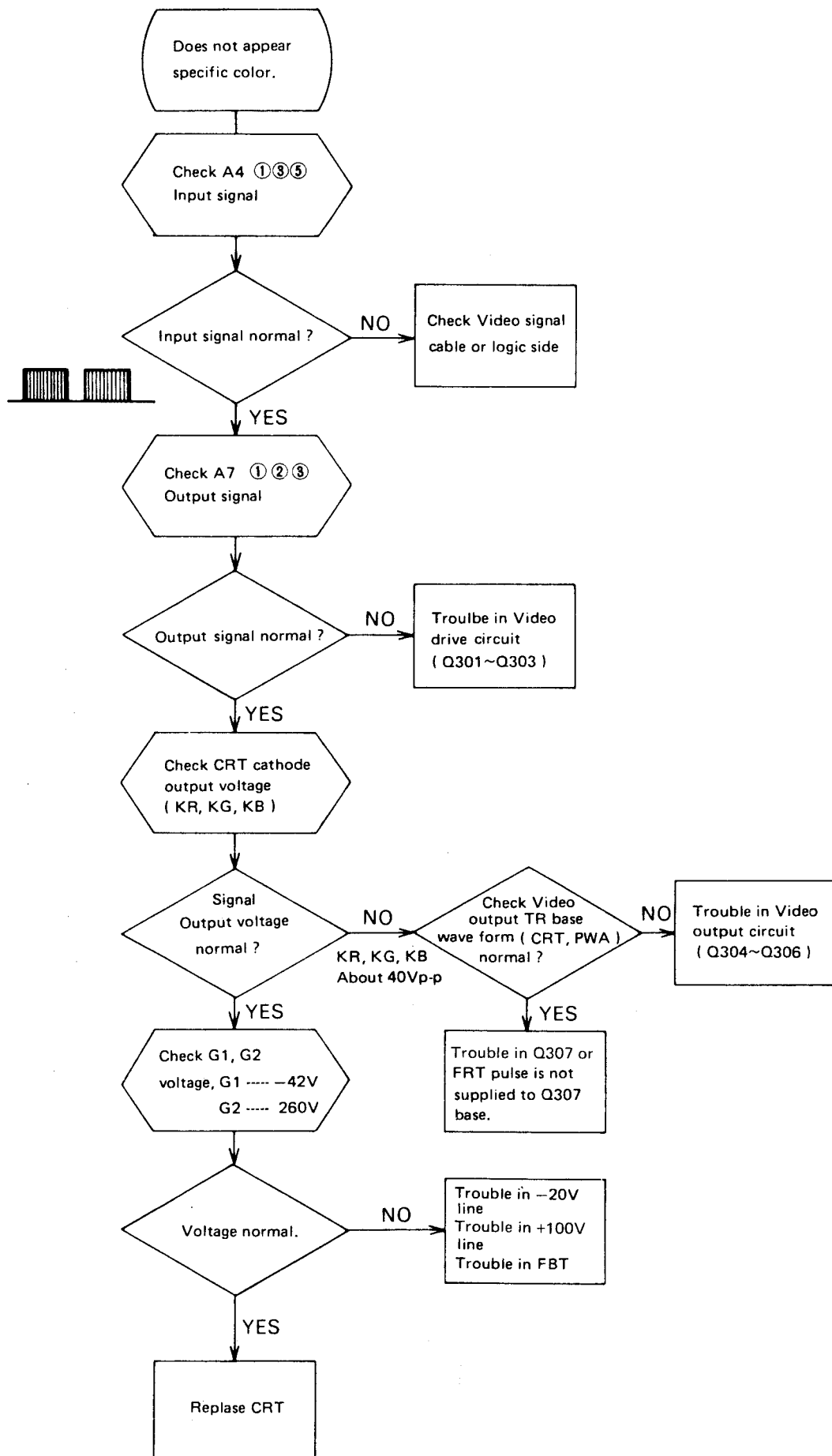
b No Raster



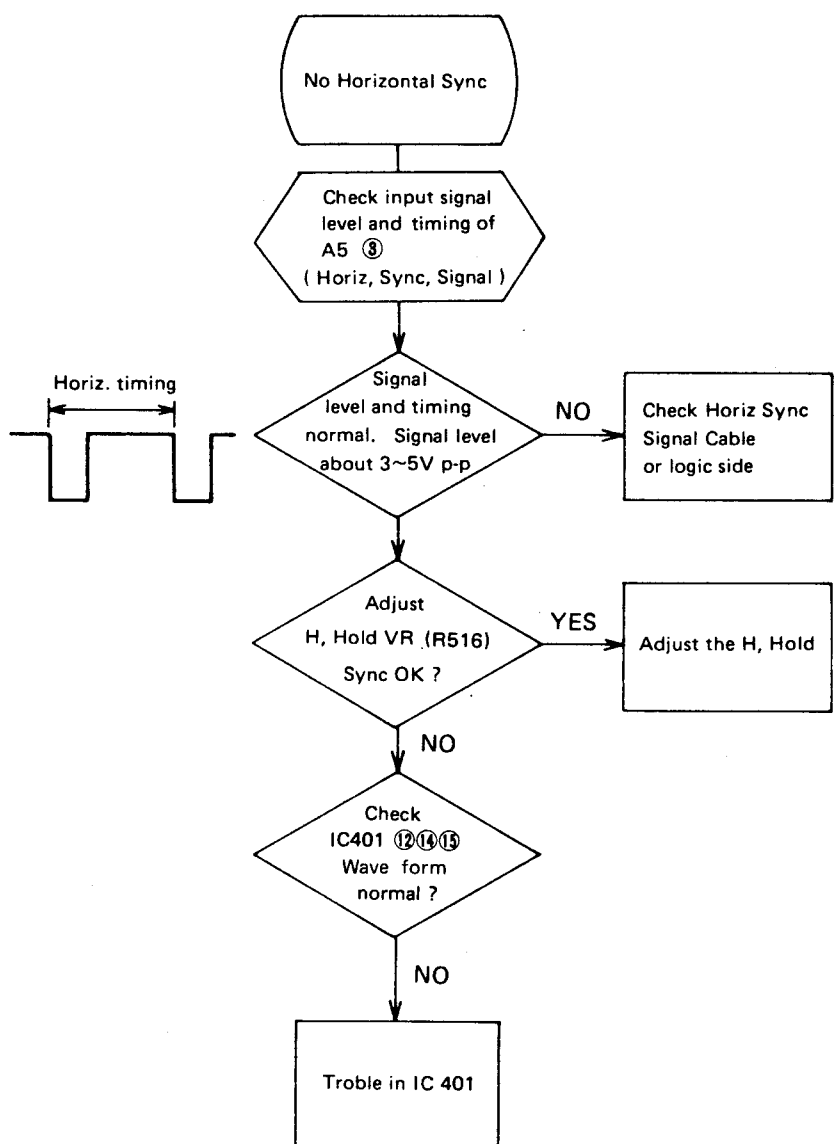
②-1 Trouble in Horiz Out Circuit



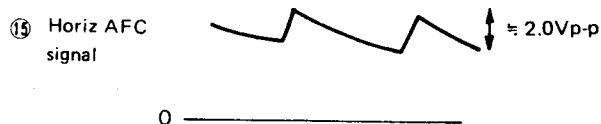
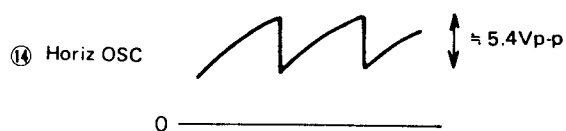
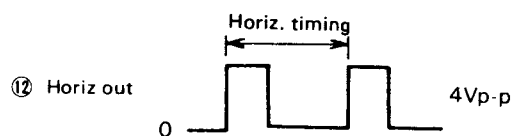
© Does not appear specific color



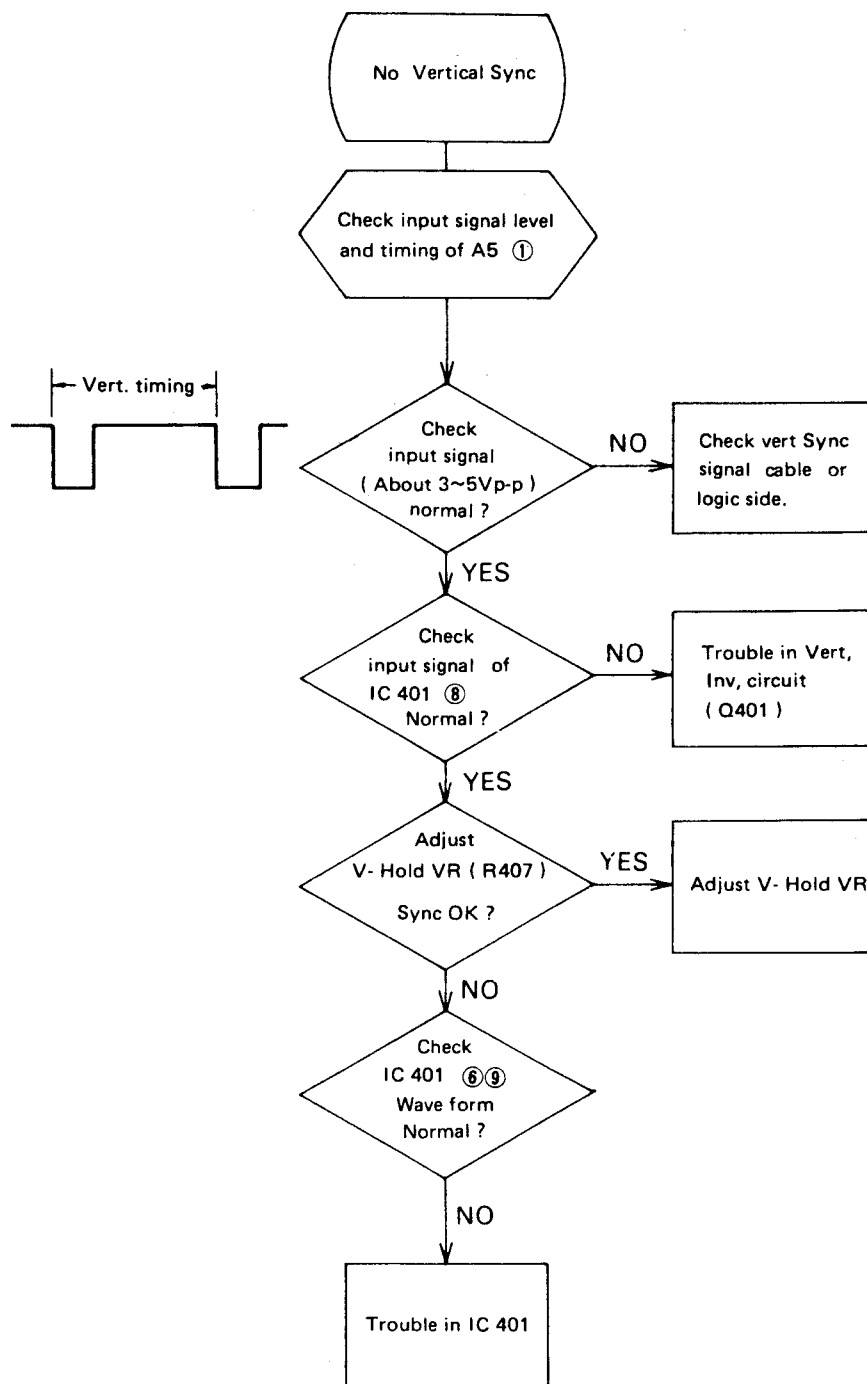
④ NO Horizontal Sync.



IC401

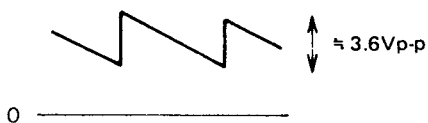


④ NO Vertical Sync.

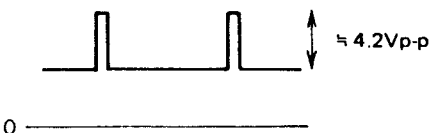


IC401

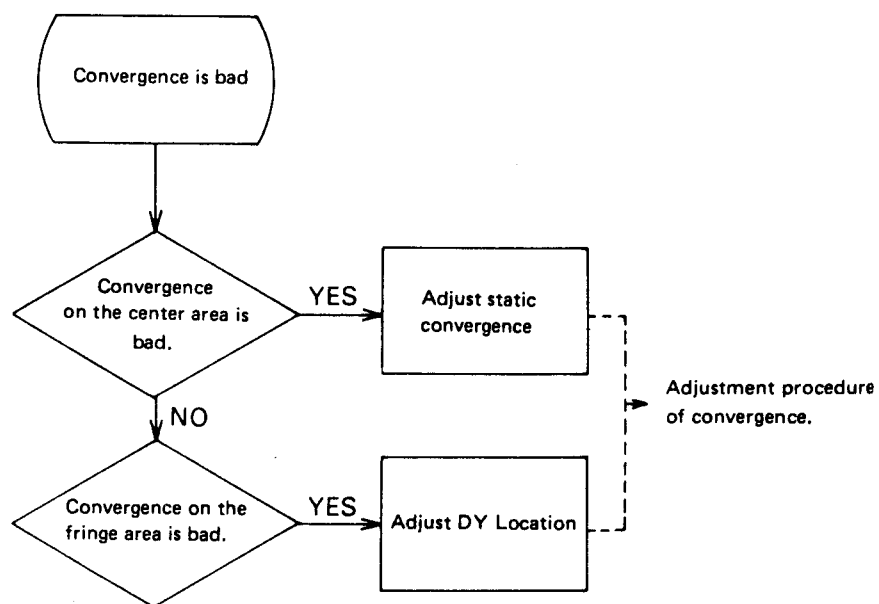
⑥ Vert out



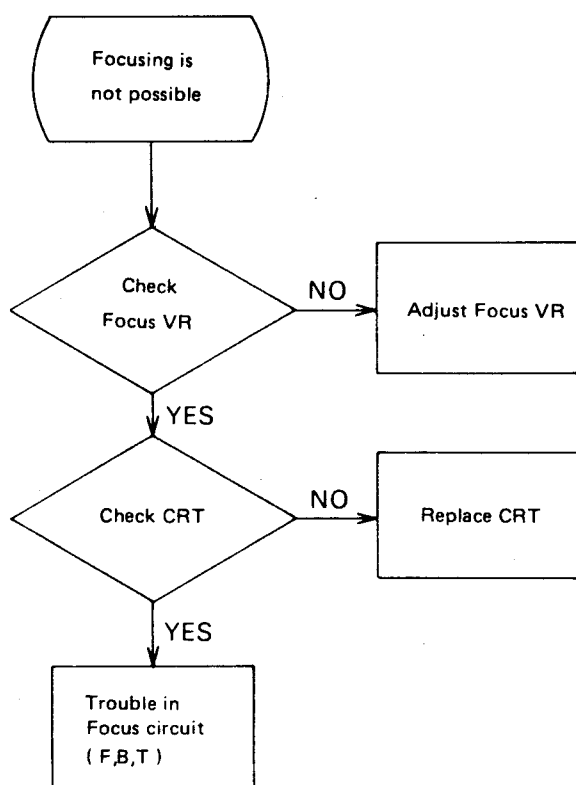
⑨ Vert OSC



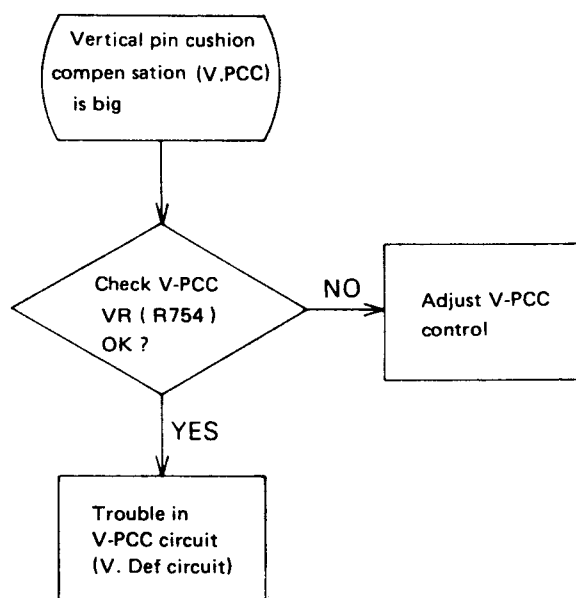
① Convergence is Bad



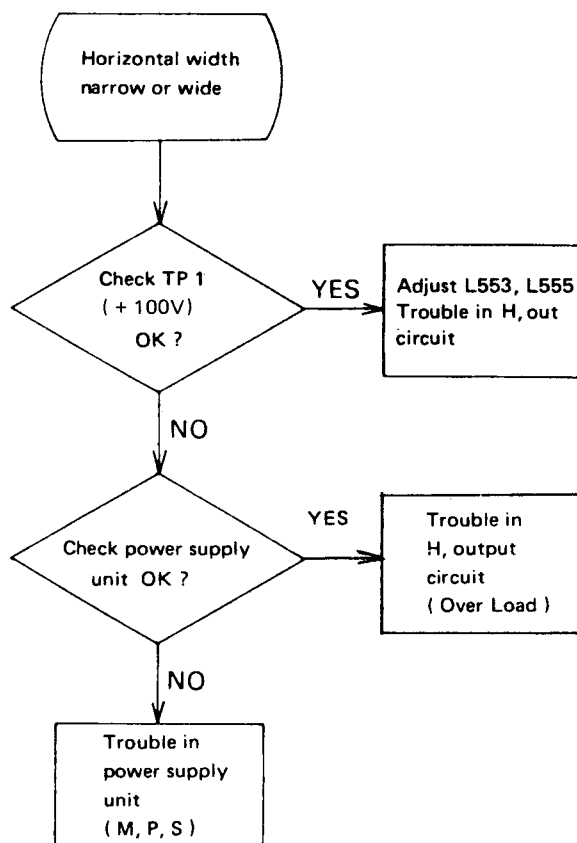
② Focusing Problem



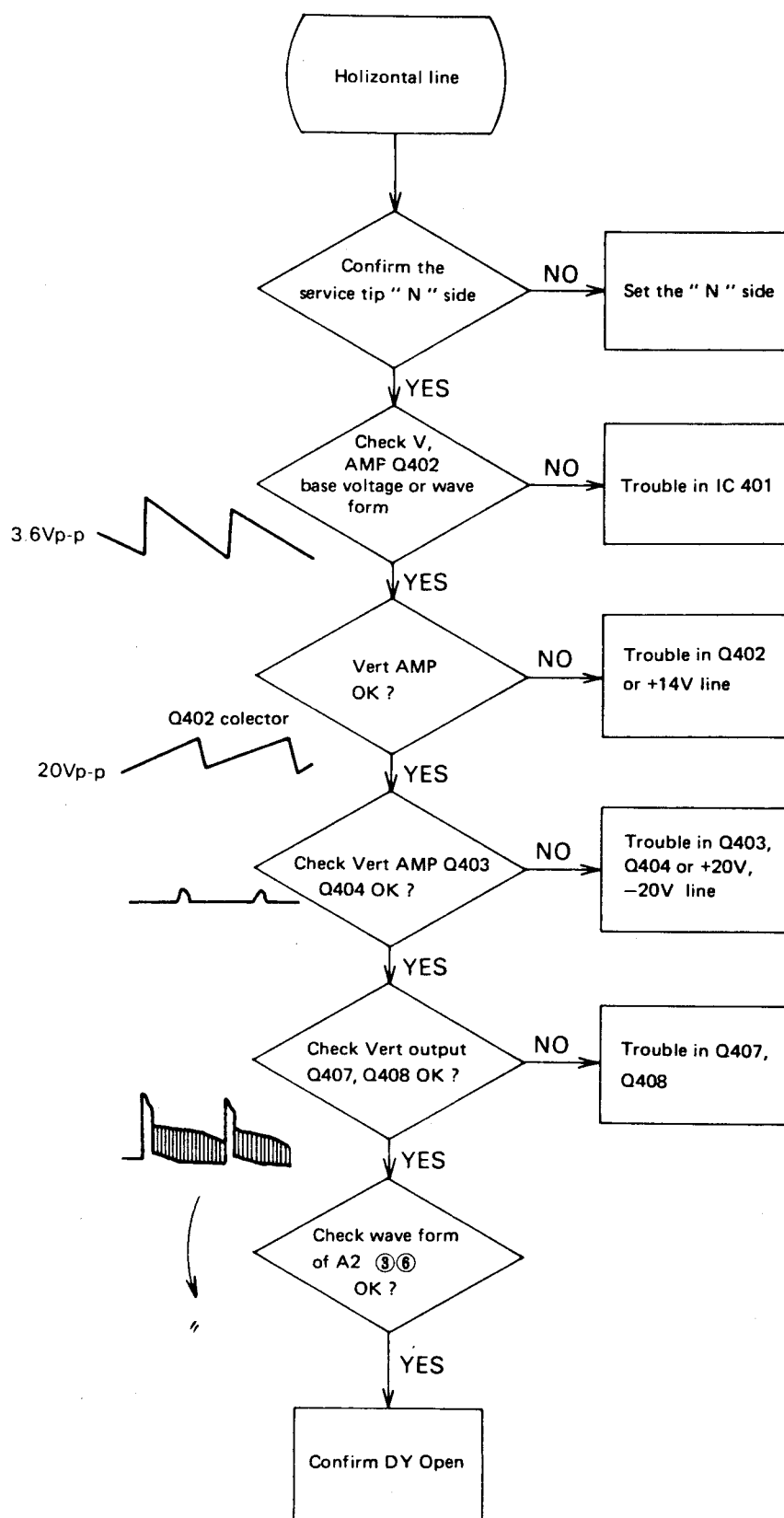
h Vertical Pin Compensation (V.PCC) is big



i Horizontal width is Abnormal



① Horizontal Line



REPLACEMENT PARTS LIST

Important Safety Notice

Components identified by the International symbol Δ have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

Note: Tolerance J: $\pm 5\%$ K: $\pm 10\%$ Z: $\pm \frac{80}{20}\%$ C: $\pm 0.25\text{pF}$

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
CABINET AND MAIN CHASSIS PARTS			SUB. P.C. BOARD TNP89912-21		
	TUW85901	Side Plate Right	CN2	TJS828370	Socket
	TUW85902	Side Plate Left		TXAJTC4P255	4P Connector Ass'y
	TUX85814-2	Side Bracket Right		TXAJTC6P175	6P Connector Ass'y
	TUX85815-2	Side Bracket Left	MAIN P.C. BOARD TNP82832-13		
	TUX85816	Bottom Plate	I.C.		
	TKX850501	P.C. Board Holder Bracket	IC401	TVSEN11235	I. C
	TKX850401	P.C. Board Holder	TRANSISTORS		
	TNP82832-13	Main P.C. Board Ass'y	Q301	2SC2901	Transistor (KL1)
	TNP85953-22	CRT P.C. Board Ass'y	Q302	2SC2901	Transistor (KL1)
	TNP82560-23	Power P.C. Board Ass'y	Q303	2SC2901	Transistor (KL1)
Δ	320DAB22TC01	(CRT) Picture Tube	Q401	2SC1685	Transistor
Δ	TLK859008N	Degauss Coil	Q402	2SC1685	Transistor
	TNP89912-21	Sub. P.C. Board Ass'y	Q403	2SA564A	Transistor
	TUC85907	Power Case	Q404	2SA564A	Transistor
	TUC85908	Power Cover	Q406	2SC1473QNC	Transistor
	TUX85108-1	Bracket	Q407	2SC2660LBP	Transistor
	TUX85205	Connector Bracket	Q408	2SA1133LBP	Transistor
	TUW85304	Switch Bracket	Q502	2SC2653HLB	Transistor
	TUX85112	Power Block Bracket	Q503	2SA564A	Transistor
	TES201	Coil Spring	Q504	2SA564A	Transistor
	TMM81460	Rubber	Q751	2SC1226AC	Transistor
	TMM1459	Clip	DIODES		
	TMM15202	Crt Socket Cover	D301	MA150	Diode
	TMM5402-1	Cord Band	D302	MA150	Diode
	TMM81452	Insulator	D303	MA150	Diode
	TMM85404	Barrier	D304	MA161	Diode
	TMK84503	L. P.C. Board Barrier	D305	MA161	Diode
	TMK13511	Tr. Barrier	D306	MA161	Diode
	TMK3410	Mica Seat	D401	TVSRD12FB	Diode
	TMK84520	Power P.C. Board Barrier	D402	TVSRD9R1EB1	Diode
	TBM80844-1	Model (Plate) TX1201FH	D403	TVSRD5R1EB2	Diode
	TXAJTA6P156	6P Connector Ass'y (A2)	D406	MA26W0	Diode
	TXAJTA3P478A	3P Connector Ass'y	D407	TVS10E2	Diode
	TXAJTA2P015	2P Connector Ass'y	D408	TVSRD5R1EB2	Diode
	TXAJTA3P479	3P Connector Ass'y	D502	TVSB1201RKT	Diode
Q551 Δ	2SD951	Transistor	D503	TVSRD6R2EB2	Diode
VR305	EVV58AF25B23	Control	D552	MA162	Diode
	TPC851422	(Outer) Carton TX1201FH	D554	TVS10E2	Diode
	TXAPD11201ZE	Filler Complete	D555	TVSB2406C	Diode
	TPE174005	Set Cover	D556	TVSB2406C	Diode
	TQA811117	Schematic (Diagram) TX1201FH	D557	TVSB2404D	Diode
	TQE616	Bag	D558	TVSB2404D	Diode
	TQF80759	Warning Label	D559	TVSB2406C	Diode
	XTB4+20BFN	Screw (CRT)			
	XWG5H14	Washer (CRT)			
	XWA5B	Washer (CRT)			
	XTB4+8BFN	Screw (Power Block)			
	XTV3+20BFN	Screw (P.C. Board Holder)			
	XTV3+8BFN	Screw (Connector Bracket)			

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
COILS & TRANS.			R307	ERD25FJ470K	Carbon 47Ω J ¼W
L553	TLH85704	H. Width Coil	R308	EVTS3MA00B23	Control 2KΩB
L554	TLH6622P	H. Lin. Coil (T.V)	R311	ERD50FJ222	Metal 2.2KΩ J ¼W
T501	TLH6466	H. Drive Coil	R312	ERD25FJ331K	Carbon 180Ω J ¼W
T551	TLF84609	Flyback Trans	R313	ERD25FJ560K	Carbon 56Ω J ¼W
T751	TLH15754	V. PCC Coil	R314	ERD25FJ272K	Carbon 2.7KΩ J ¼W
CAPACITORS			R316	ERD25FJ180K	Carbon 18Ω J ¼W
C301	ECEA1ES101	Electrolytic 100μF 25V	R317	ERD25FJ470K	Carbon 47Ω J ¼W
C303	ECEA1CS100	Electrolytic 10μF 16V	R318	EVTS3MA00B23	Control 2KΩB
C304	ECKD1H151KB2	Ceramic 150pF K 50V	R321	ERD50FJ222	Metal 2.2KΩ J ¼W
C305	ECEA1CS100	Electrolytic 10μF 16V	R322	ERD25FJ331K	Carbon 330Ω J ¼W
C306	ECKD1H151KB2	Ceramic 150pF K 50V	R323	ERD25FJ560K	Carbon 56Ω J ¼W
C307	ECEA1CS100	Electrolytic 10μF 16V	R324	ERD25FJ272K	Carbon 2.7KΩ J ¼W
C308	ECKD1H151KB2	Ceramic 150pF K 50V	R326	ERD25FJ180K	Carbon 18Ω J ¼W
C309	ECEA2AS101	Electrolytic 100μF 100V	R327	ERD25FJ470K	Carbon 47Ω J ¼W
C401	ECEA1CS101	Electrolytic 100μF 16V	R328	EVTS3MA00B23	Control 2KΩB
C402	ECEA1HS010	Electrolytic 1μF 50V	R401	ERD50FJ221K	Carbon 220Ω J ¼W
C403	ECQM1H273JZ	Polyester 0.027μF J 50V	R402	ERD25FJ562K	Carbon 5.6KΩ J ¼W
C404	ECQM1H472JZ	Polyester 4700pF J 50V	R403	ERD25FJ122K	Carbon 1.2KΩ J ¼W
C405	ECSF25E2R2N	Tantalum 2.2μF 25V	R404	ERD25FJ332K	Carbon 3.3KΩ J ¼W
C408	ECEA1CS100	Electrolytic 10μF 16V	R405	ERD25FJ562K	Carbon 5.6KΩ J ¼W
C409	ECEA1HN010S	Electrolytic 1μF 50V	R406	ERD25FJ561K	Carbon 560Ω J ¼W
C410	ECQM1H104JZ	Polyester 0.1μF J 50V	R407	EVTV0UA00B53	Control 5KΩB
C411	ECQM1H222JZ	Polyester 2200pF J 50V	R408	ERD25FJ332K	Carbon 3.3KΩ J ¼W
C501	ECEA1HS010	Electrolytic 1μF 50V	R409	ERD25FJ123K	Carbon 12KΩ J ¼W
C502	ECEA1HS010	Electrolytic 1μF 50V	R410	ERD25FJ822K	Carbon 8.2KΩ J ¼W
C503	ECQM1H104JZ	Polyester 0.1μF J 50V	R415	ERD25FJ152K	Carbon 1.5KΩ J ¼W
C504	ECQM1H223JZ	Polyester 0.022μF J 50V	R416	ERD25FJ272K	Carbon 2.7KΩ J ¼W
C505	ECKD1H222KB2	Ceramic 2200pF K 50V	R417	ERD25FJ272K	Carbon 2.7KΩ J ¼W
C506	ECEA1HS010	Electrolytic 1μF 50V	R418	ERD25FJ821K	Carbon 820Ω J ¼W
C507	ECQM1H103JZ	Polyester 0.01μF J 50V	R419	ERD25FJ223K	Carbon 22KΩ J ¼W
C508	ECQM1H272JZ	Polyester 2700pF J 50V	R420	EVTV0UA00B52	Control 500ΩB
C509	ECQF6272KZ	Polypropylene 2700pF K 600V	R421	ERD25FJ821K	Carbon 820Ω J ¼W
C510	ECEA1CS470	Electrolytic 47μF 16V	R422	ERD50FJ331K	Carbon 330Ω J ¼W
C511	ECKD2H391KB9	Ceramic 390pF K 500V	R423	ERD25FJ122K	Carbon 1.2KΩ J ¼W
C512	ECEA1CS330	Electrolytic 33μF 16V	R424	EVTS3MA00B14	Control 10KΩB
C513	ECEA1VS470	Electrolytic 47μF 35V	R425	ERD50FJ102	Carbon 1KΩ J ¼W
C552	ECWH12H472JS	Polypropylene 4700pF J ¼W	R426	EVTV0UA00B23	Control 2KΩB
C553	ECQM1H154JZ	Polyester 0.15μF J 50V	R427	ERD25FJ822K	Carbon 8.2KΩ J ¼W
C554	ECEA2DS100	Electrolytic 10μF 200V	R428	ERD25FJ122K	Carbon 1.2KΩ J ¼W
C556	ECEA160N1	Electrolytic 1μF 160V	R429	ERD25FJ122K	Carbon 1.2KΩ J ¼W
C557	ECEA1ES331	Electrolytic 330μF 25V	R432	ERG1ANJ103	Metal 10KΩ J 1W
C558	ECEA2AS331	Electrolytic 330μF 160V	R433	ERD25FJ560K	Carbon 56Ω J ¼W
C559	ECEA1ES101	Electrolytic 100μF 25V	R434	ERD25FJ1R0K	Carbon 1Ω J ¼W
C560	ECWF2H684JZ	Polypropylene	R435	ERD25FJ1R0K	Carbon 1Ω J ¼W
C564	ECKD3D182KB8	Ceramic 1800pF K	R436	ERD25FJ2R2K	Carbon 2.2Ω J ¼W
C752	ECEA1EN470S	Electrolytic 47μF 25V	R437	ERD25FJ152K	Carbon 1.5KΩ J ¼W
C753	ECEA1HN3R3S	Electrolytic 3.3μF 50V	R438	ERD25FJ102K	Carbon 1KΩ J ¼W
RESISTORS & CONTROL			R439	ERD25FJ221K	Carbon 220Ω J ¼W
R301	ERD50FJ222	Carbon 2.2KΩ J ¼W	R501	ERD25FJ562K	Carbon 5.6KΩ J ¼W
R302	ERD25FJ331K	Carbon 330Ω J ¼W	R503	ERD25FJ332K	Carbon 3.3KΩ J ¼W
R303	ERD25FJ560K	Carbon 56Ω J ¼W	R505	ERD25FJ222K	Carbon 2.2KΩ J ¼W
R304	ERD25FJ272K	Carbon 2.7KΩ J ¼W	R507	ERD25FJ273K	Carbon 27KΩ J ¼W
R306	ERD25FJ180K	Carbon 18Ω J ¼W	R508	ERD25FJ824K	Carbon 820KΩ J ¼W
			R509	ERD50FJ222K	Carbon 2.2KΩ J ¼W

Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
R510	ERD50FJ101K	Carbon 100Ω J ¼W	DIODES		
R511	ERD25FJ154K	Carbon 150KΩ J ¼W	D311	MA162	Diode
R512	ERD25FJ562K	Carbon 5.6KΩ J ¼W	D312	MA162	Diode
R513	ERD25FJ683K	Carbon 68KΩ J ¼W	D313	MA162	Diode
R514	ERD25FJ103K	Carbon 10KΩ J ¼W	D314	MA162	Diode
R516	EVTV0UA00B53	Control 5KΩB	D315	MA162	Diode
R517	ERD25FJ471K	Carbon 470Ω J ¼W	D316	MA162	Diode
R518	ERD25FJ681K	Carbon 680Ω J ¼W	COILS		
R519	ERD25FJ560K	Carbon 56Ω J ¼W	L301	TLH3802C	Coil
R520	ERG3ANJ682	Metal 6.8KΩ J 3W	L302	TLT068-999	Peaking Coil
R521	ERG5ZJ272	Metal 2.7KΩ J 5W	L303	TLT015-999	Peaking Coil
R523	ERD25FJ272K	Carbon 2.7KΩ J ¼W	L304	TLT068-999	Peaking Coil
R524	ERD25FJ102K	Carbon 1KΩ J ¼W	L305	TLT015-999	Peaking Coil
R525	ERD25FJ2R2K	Carbon 2.2Ω J ¼W	L306	TLT082-999	Peaking Coil
R526	ERD25FJ101K	Carbon 100Ω J ¼W	L307	TLT027-999	Peaking Coil
R527	ERD25FJ152K	Carbon 1.5KΩ J ¼W	CAPACITORS		
R528	ERD25FJ152K	Carbon 1.5KΩ J ¼W	C311	ECEA2AS470	Electrolytic 47μF 100V
R529	ERD25FJ103K	Carbon 10KΩ J ¼W	C312	ECQM1H104JZ	Polyester 0.1μF J 50V
R531	ERD25FJ332K	Carbon 3.3KΩ J ¼W	C313	ECQE1105KZ	Polyester 1μF K 100V
R533	ERD25FJ102K	Carbon 1KΩ J ¼W	C314	ECKD2H101KB2	Ceramic 100pF K 500V
R540	EVTV0UA00B23	Control 2KΩB	C315	ECQM1H104JZ	Polyester 0.1μF J 50V
R552	ERD25FJ394K	Carbon 390KΩ J ¼W	C316	ECQE1105KZ	Polyester 1μF K 100V
R553	ERD25FJ104K	Carbon 100KΩ J ¼W	C317	ECKD2H101KB2	Ceramic 100pF K 500V
R554	EVT3MA00B25	Control 2MΩB	C318	ECQM1H104JZ	Polyester 0.1μF J 50V
R555	ERD50FJ154	Carbon 150KΩ J ¼W	C319	ECQE1105KZ	Polyester 1μF K 100V
R556	ERD25FJ104K	Carbon 100KΩ J ¼W	C320	ECKD2H101KB2	Ceramic 100pF K 500V
R558	ERQ12JH1R0	Fuseble 1Ω J ½W	C321	ECEA1HN010S	Electrolytic 1μF 50V
R559	ERD25FJ2R7K	Carbon 2.7Ω J ¼W	C371	ECQE4334KZ	Polyester 0.33μF K 400V
R560	ERQ12JH1R0	Fuseble 1Ω J ½W	C372	ECQE10103KZ	Polyester 0.01μF K 1KV
R564	ERG1ANJ122	Metal 1.2KΩ J 1W	RESISTORS & CONTROL		
R752	ERD25FJ821K	Carbon 820Ω J ¼W	R330	ERD25FJ102K	Carbon 1KΩ J ¼W
R753	ERG1ANJ181	Metal 180Ω J 1W	R331	ERG3ANJ681	Metal 680Ω J 3W
R754	EVT3MA00B53	Control 5KΩB	R332	ERG1ANJ151	Metal 150Ω J 1W
R755	ERD25FJ390K	Carbon 39Ω J ¼W	R334	ERD25FJ471K	Carbon 470Ω J ¼W
R756	ERD25FJ123K	Carbon 12KΩ J ¼W	R335A	ERD25FJ101K	Carbon 100Ω J ¼W
R757	ERD25FJ182K	Carbon 1.8KΩ J ¼W	R336	ERD25FJ224K	Carbon 220KΩ J ¼W
OTHER PARTS			R337	ERD25FJ121K	Carbon 120Ω J ¼W
S551	TGPS152GL	Spark Gap	R338	EVMH0GA00B13	R. Low Light 1KΩB
A1	TJS868250	3P Housing Socket	R339	ERD25FJ391K	Carbon 390Ω J ¼W
A4	TJS868280	6P Housing Socket	R340	ERD25FJ102K	Carbon 1KΩ J ¼W
A5	TJS868260	4P Housing Socket	R341	ERG3ANJ681	Metal 680Ω J 3W
A7	TJS868280	6P Housing Socket	R342	ERG1ANJ151	Metal 150Ω J 1W
A8	TJS868280	6P Housing Socket	R344	ERD25FJ471K	Carbon 470Ω J ¼W
A9	TJS868250	3P Housing Socket	R345A	ERD25FJ101K	Carbon 100Ω J ¼W
	TMK81423	Mica Seet	R346	ERD25FJ224K	Carbon 220KΩ J ¼W
	TES6162	Tr. Spring	R347	ERD25FJ121K	Carbon 120Ω J ¼W
	TUX85810-1	Flyback Bracket	R348	EVMH0GA00B13	G. Low Light 1KΩB
	TXAJTA1P076A	1P Connector Ass'y	R349	ERD25FJ391K	Carbon 390Ω J ¼W
CRT P.C. BOARD TNP85953-22			R350	ERD25FJ102K	Carbon 1KΩ J ¼W
TRANSISTORS			R351	ERG3ANJ681	Metal 680Ω J 3W
Q304	2SC2590	Transistor (P.Q)	R352	ERG1ANJ151	Metal 150Ω J 1W
Q305	2SC2590	Transistor (P.Q)	R354	ERD25FJ102K	Carbon 1KΩ J ¼W
Q306	2SC2590	Transistor (P.Q)	R355A	ERD25FJ101K	Carbon 100Ω J ¼W
Q307	2SC1573ANC	Transistor			

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
R356	ERD25FJ224K	Carbon 220K Ω J $\frac{1}{4}$ W	C804	△ ECKDEL222ZE	Ceramic 2200pF
R357	ERD25FJ121K	Carbon 120 Ω J $\frac{1}{4}$ W	C805	ECES2DV331S	Electrolytic 330 μ F 200V
R358	EVMH0GA00B13	B. Low Light 1K Ω B	C806	ECES2DV331S	Electrolytic 330 μ F 200V
R359	ERD25FJ391K	Carbon 390 Ω J $\frac{1}{4}$ W	C807	ECQE4104KZ	Polyester 0.1 μ F K 400V
R361	△ ERD25FJ471K	Carbon 470 Ω J $\frac{1}{4}$ W	C808	ECQE4104KZ	Polyester 0.1 μ F K 400V
R362	ERD25FJ102K	Carbon 1K Ω J $\frac{1}{4}$ W	C809	ECQM1H333JZ	Polyester 0.033 μ F J 50V
R363	ERG2ANJ332	Metal 3.3K Ω J 2W	C810	ECQM1H104JZ	Polyester 0.033 μ F J 50V
R371	ERC12GJ185	Solid 1M Ω J $\frac{1}{2}$ W	C811	ECQM1H473JZ	Polyester 0.033 μ F J 50V
R372	EVME6U10KB46	Control 4M Ω B	C812	ECEA25Z22	Electrolytic 22 μ F 25V
S361	TGPS152GL	Spark Gap	C813	ECQV05105JZ	Electrolytic J
OTHER PARTS			C814	ECEA1AS101	Electrolytic 100 μ F 10V
S362	TGPS152GL	Spark Gap	C815	ECQM1H103JZ	Polyester 0.01 μ F J 50V
S363	TGPS152GL	Spark Gap	C816	ECEA1HS101	Electrolytic 100 μ F 50V
	TJS35030	CRT Socket	C818	ECKD3A222KB8	Ceramic 2200pF K
	TXAJTC3P453	3P Connector Ass'y (A9)	C819	ECQM1H154JZ	Polyester 0.15 μ F J 50V
	TXAJTC6P158A	6P Connector Ass'y (A8)			
	TXAJTC6P157E	6P Connector Ass'y (A7)	C821	ECEA2DS101	Electrolytic 100 μ F 200V
	TSC8906-0	Ferrite Core	C823	ECEA2DS101	Electrolytic 100 μ F 200V
TRANSISTORS			C825	ECQE6103KZ	Polyester 0.01 μ F K 600V
Q801	2SA720	Transistor (R.S)	RESISTOR & CONTROL		
Q802	2SA886BF	Diode (Q.R)	R801	ERF15ZXK5R6	Non Flame 5.6 Ω K 15W
Q803	2SC1847BF	Diode (Q.R)	R804	△ ERF5AJ680	Non Flame 68 Ω J 5W
Q804	M23CED	Transistor	R805	△ ERC12ZGK335	Solid 3.3M Ω K $\frac{1}{2}$ W
Q805	2SC2834A	Transistor	R806	ERC1GK154	Solid 150K Ω K 1W
			R807	ERD50FJ474	Carbon 470K Ω J $\frac{1}{2}$ W
DIODES			R808	ERD25FJ102K	Carbon 1K Ω J $\frac{1}{4}$ W
D801	△ ERPF6B0M100F	Ceramic	R809	△ ERD25FJ182K	Carbon 1.8K Ω J $\frac{1}{4}$ W
D802	△ ERPF5B0M120G	Ceramic	R811	△ ERD25FJ272K	Carbon 2.7K Ω J $\frac{1}{4}$ W
D803	△ ERPF5B0M120G	Ceramic	R812	ERD25FJ681K	Carbon 680 Ω J $\frac{1}{4}$ W
D804A	△ TVS10E2	Diode	R813	△ ERD25FJ2R7K	Carbon 2.7 Ω J $\frac{1}{4}$ W
D804B	△ TVS10E2	Diode	R814	ERD25FJ101K	Carbon 100 Ω J $\frac{1}{4}$ W
D805A	△ TVS10E2	Diode	R815	ERD25FJ101K	Carbon 100 Ω J $\frac{1}{4}$ W
D805B	△ TVS10E2	Diode	R816	ERF3AKR82	Non Flame 0.82 Ω K 3W
D807	TVSN413M	Diode	R817	ERD25FJ102K	Carbon 1K Ω J $\frac{1}{4}$ W
D808	ERD25FJ121K	Carbon 120 Ω J $\frac{1}{4}$ W	R818	ERD25FJ561K	Carbon 560 Ω J $\frac{1}{4}$ W
D809	△ TVSRD5R1EB2	Diode	R820	ERD25FJ222K	Carbon 2.2K Ω J $\frac{1}{4}$ W
D810	TVSRD20EB3	Diode	R821	△ ERD25FJ100K	Carbon 10 Ω J $\frac{1}{4}$ W
D811	TVSB2404D	Diode	R822	ERD25FJ331K	Carbon 330 Ω J $\frac{1}{4}$ W
D312	TVSB2404D	Diode	R823	ERF10ZJ680	Non Flame 68 Ω J 10W
D813	TVSB2404D	Diode	R824	ERF10ZJ680	Non Flame 68 Ω J 10W
D814	TVSB2404D	Diode	R825	ERF5AJ330	Non Flame 33 Ω J 5W
D815	TVSB2404D	Diode	R826	ERG3ANJ153	Metal 15K Ω J 5W
D816	TVSUF-3VT	Diode	R827	ERC12GJ153	Solid 15K Ω J $\frac{1}{2}$ W
D817	TVSB2404D	Diode	R828	ERD25FJ564K	Carbon 560K Ω J $\frac{1}{4}$ W
D818	TVSUF-3VT	Diode	R839	ERD25FJ564K	Carbon 560K Ω J $\frac{1}{4}$ W
D822	△ TVSMI-15R	Diode	VR81	△ EVTV0UA00B13	Control 1K Ω B
D823	△ TVSMI-15S	Diode	OTHER PARTS		
COILS & TRANS.			S801	TNQ8947	Spleter
L801	TLP85604E	Coil Trans.	FS1,3	TJC305-1	Fuse Holder
L802	TLT341-119C	Peaking Coil	G1	TJC6137	GND Spring
T801	△ TLP85905-1	Trans.		TES6162	TR Spring
CAPACITORS				TMK81423	Mica Seat
C801	△ ECQU1A473ME	Ceramic 0.047 μ F		XBA2F30NU100	Fuse 3A
C802	△ ECQU1A473ME	Ceramic 0.047 μ F		ESD391	Selecter Switch
C803	△ ECKDEL222ZE	Ceramic 2200pF		TXAJTA4P246A	4P Connector Ass'y
				TXAJTV3P527	3P Connector Ass'y
				TXAJTX4P247	4P Connector Ass'y

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